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Electrical World

A McGRAW-HILL PUBLICATION

MAY 24, 1947

FARM ELECTRIFICATION

THE INDUSTRY'S NEXT OBJECTIVE

★

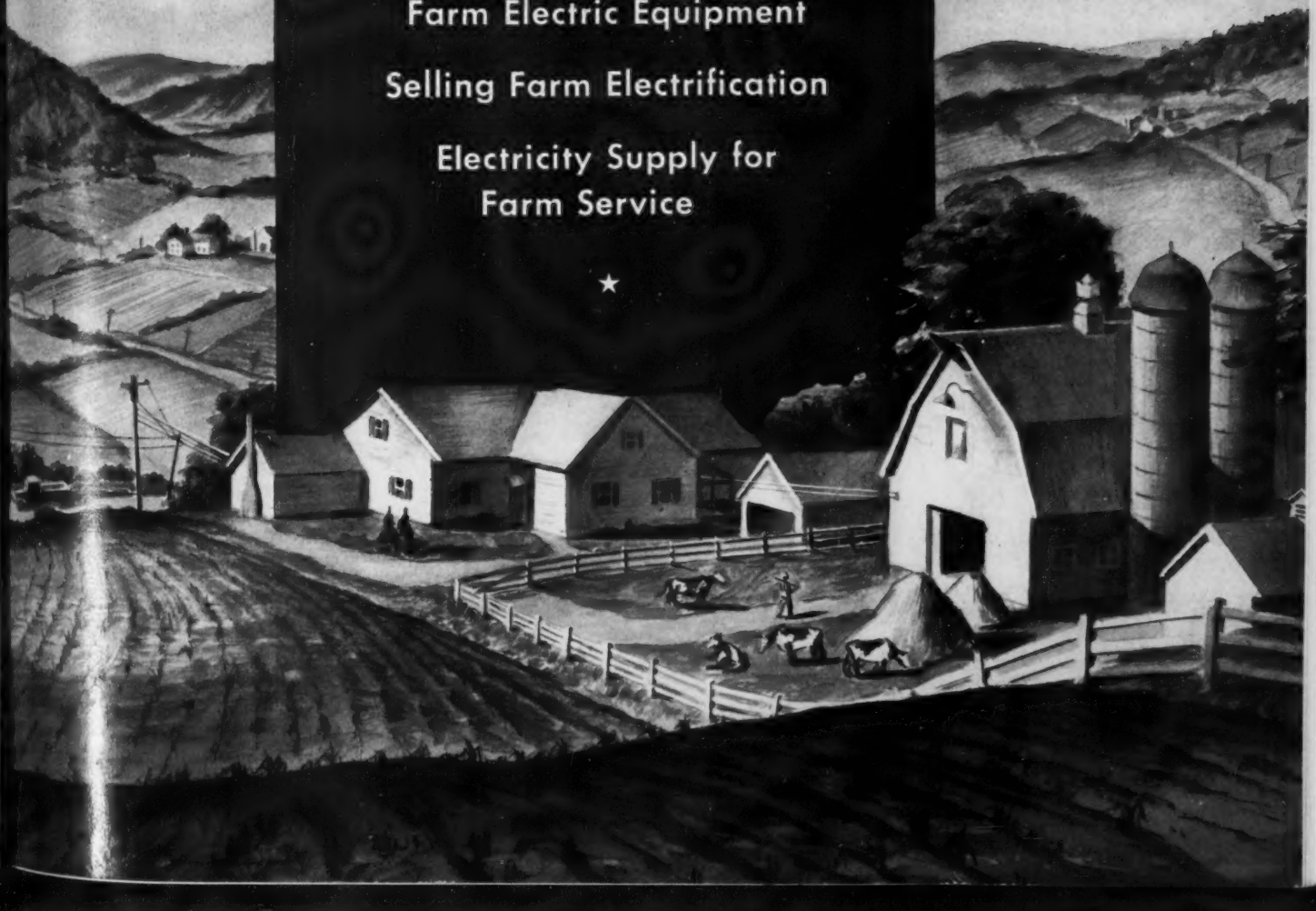
The Over-All View

Farm Electric Equipment

Selling Farm Electrification

Electricity Supply for Farm Service

★



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Electrical World

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May 24, 1947 — Vol. 127, No. 21

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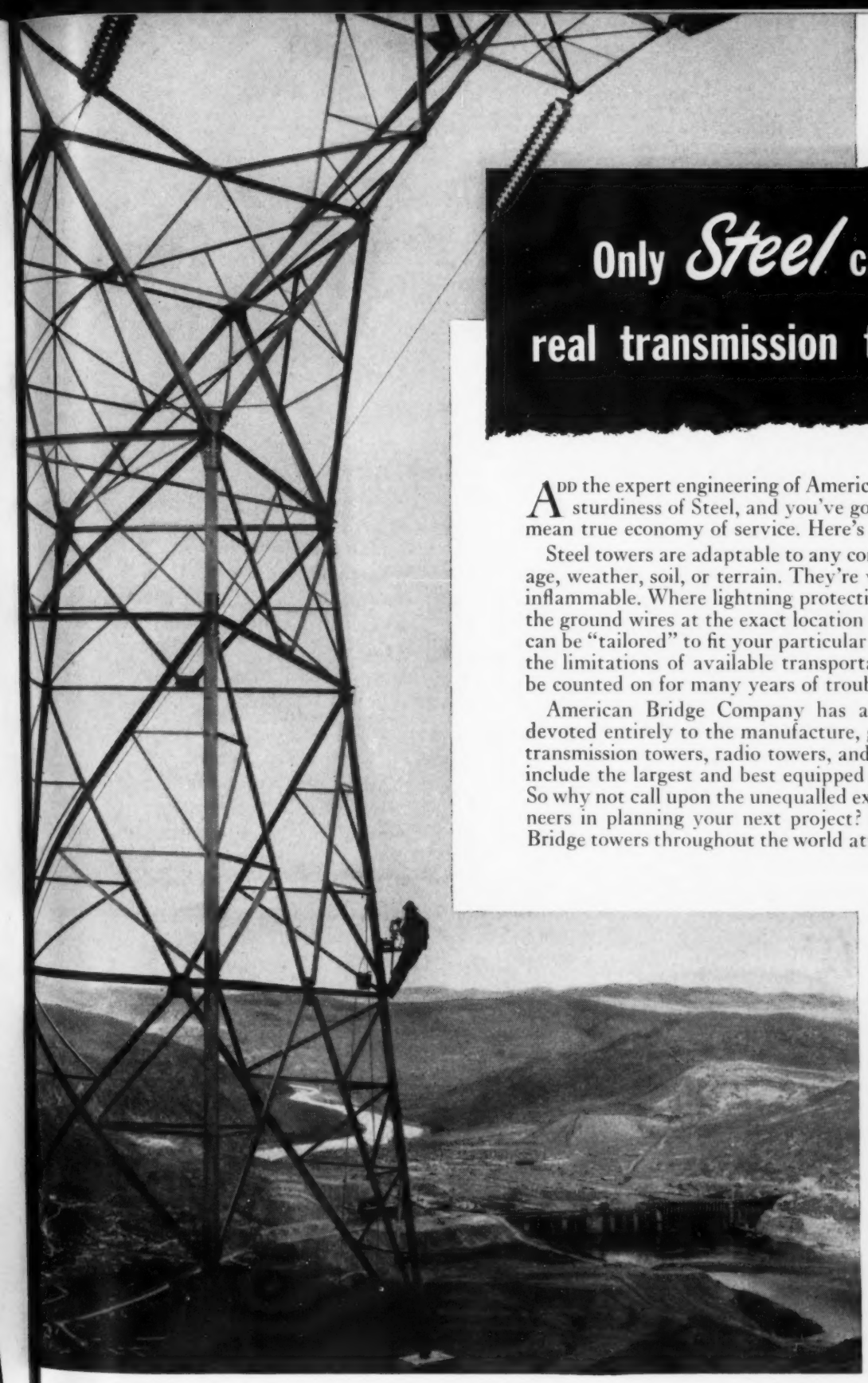

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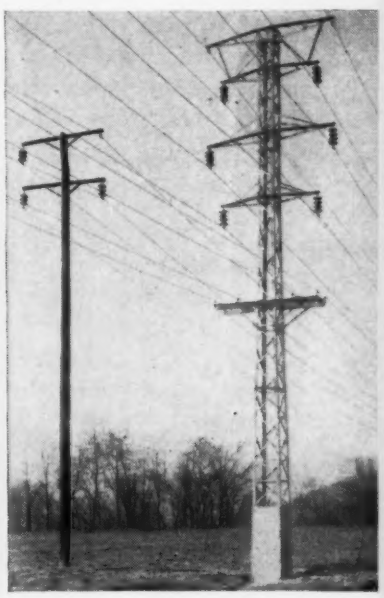

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WORLD LEADERSHIP...

Our Duty and Our Opportunity

CAPITALISM in Europe and the rest of the world is challenged by a real and formidable rival, communism. For capitalism to thrive a reasonable amount of prosperity is essential. Communism uses poverty to advance itself.

Except for the Western Hemisphere, most of the world came out of the war poor. Two years after V-E Day it is still poor. It needs dollars. It needs credit. It needs capital. It needs trade. It needs technical and managerial skills.

If we in America are to help the rest of the world back to its feet, starting it again on the road to peace and a free economy, we should try to supply those needs within the limits of our capacity.

We must not overtax our own strength. For the first requirement of a stable world is a strong United States. But we must accept leadership in international economic recovery—in our own self-interest.

What can the United States do to help men back to prosperity in a world economy which will allow them *freedom and incentive*? There are many things. But here are two of the most important:

1. The United States, through Congress, must determine the pattern and the total of the foreign loans or grants it can afford. We must answer three questions. How much will the new program cost? Can we afford it? Have we the technicians and managers to watch the loans, assuring their fruitful use?
2. We must demonstrate that we do not intend to raise our tariff walls to prohibitive heights when our debtors begin to repay us in goods and services, which is the only practical way they can pay us. Otherwise our loans will become losses.

If the United States is to meet even the minimum requirements of world rehabilitation, Congress eventually must authorize more advances than those to Greece and Turkey. The $400 million for those two countries will not do the over-all job of political and economic defense which we have begun. A minimum of $5 billion, if promptly and wisely applied in eight to ten countries, might suffice. BUT this $5 billion will be on top of approximately $16.8 billion which we have spent or earmarked during the past two years for use abroad, including our full share of the World Bank and Fund. We shall do a faster and more effective job if Congress will thus add up the foreseeable total of our international aid, and, even though the total looks imposingly large, commit us to it, with proper collateral safeguards from the debtor nations.

Congress need not try to foretell all contingencies, like last winter's weather in Britain, and it certainly should not create the impression that nations need only ask for billions to receive them. On the other hand, the war should have taught us the miserable consequences of "too little and too late." The President should have learned that he engenders skepticism by going to Congress with parts of a program, as he has done in the British, Grecian and Turkish loans. Within the limits of our capacity, we must make the decision now to see the whole job through—or throw in the sponge.

In the interest of the debtor nations—as well as in our own interest—the loan program should be hard-boiled. Rehabilitation loans must really rehabilitate. They must produce a state of economic health which will permit the World Bank and private capital to take over the task of financing world recovery—as perhaps can be done today in France and the Low Countries.

The loans, therefore, must be within the limits of our technical and managerial ability to implement them. Without technical help, Greece can not use its loan effectively—to rebuild railroads, clear ports, revive agriculture. Without skilled supervisors, Germany can not be made to pay its way. Money alone won't pull China from the brink of economic chaos.

Our lending calls for more than money. It calls for trained personnel to help the recipients utilize the loans effectively—geologists, construction and sanitary engineers, monetary experts, and management and agricultural specialists.

Loans are necessary but they are only a first step. A long-range program requires the opening of the half-closed doors of world trade—our own door, too.

We will have to get used to the idea that, when our debtors pay us, they must pay us largely in goods and services. Refusal to permit such repayments in the twenties helped start the world depression in the thirties—and the loss of our investments. *Imports do tend to raise living standards, and a two-way trade program need not require us to slash our present tariff rates.*

The complexion of our foreign trade has changed since the war. Our manufacturing capacity has increased and our raw-material self-sufficiency is tending to decline. For example, we probably shall have to continue importing copper and zinc and to increase our prewar dependence on imported lead. We may soon have to depend heavily on imported oil, and—gradually—on a growing volume of iron ore from abroad. Our normal dependence on imports for commodities like rubber, tin and silk will continue.

Our population has gone up 10 million in the last decade, and we now have a $176 billion national income, making room for more imports.

As a result of every nation's recent attempts to make itself secure and self-sufficient by slamming its trade door, a world-wide series of quotas and restrictions is blocking international trade. Even more, government buying and selling threaten to take commerce out of the hands of private traders, placing it in the uninspired care of bureaucratic negotiators.

Our government has taken the lead in calling the conference of 18 nations, now meeting at Geneva, to open as many trade doors as possible. The American delegates will bargain product by product and country by country—all summer, if necessary—for lower tariffs, fewer quotas and a free flow of *private* trade. The task is a long one, and the results are as yet uncertain, but, if success is achieved, an immense opportunity for good works and good earnings will lie before American businessmen.

This is no picayunish opportunity. Authoritative estimates put our 1947 exports at $11 billion and our imports at $6 billion. That's substantial. It is greater than the value of all crops grown on our farms ($10½ billion) and exceeds the value of all shipments of industries such as automobiles ($9 billion), textiles ($8 billion) and chemicals ($8 billion).

International trade is vital, not to be shrugged off, not to be kicked around as a football of party politics. Republicans and Democrats agree on a non-partisan foreign *political* policy. They should agree also on a non-partisan foreign *economic* policy. The foreign relations of the United States, political or economic, can no longer be log-rolled hither and yon.

A general program for international recovery, outlined here, will bring its full quota of aches and pains. But lack of a program will produce economic and political troubles on a vast scale; timid retreat will invite economic disaster and war.

By an intelligent, bold and resourceful program, we have a chance to win through to a long peace in the kind of world we want. *Unless America provides the leadership, there can be no such program.* Then Communism merely needs to hang around long enough to pick up the pieces.

Ours is the responsibility and the opportunity.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

THIS IS THE 58TH OF A SERIES

A NEW ENTERPRISE

Advocacy by the McGraw-Hill Publishing Company, in the accompanying editorial, of an effective world economic policy is not a mere verbal exercise. In the faith that we as a nation shall develop such a policy, this Company, following a trail blazed by leaders in American industry and finance, is expanding its operations overseas.

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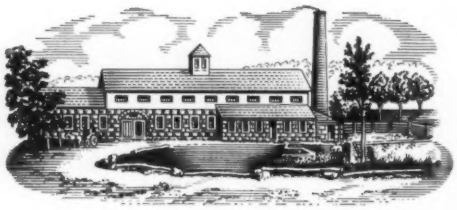

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PIONEERS IN CABLE ENGINEERING

Electrical World

MAY 24, 1947

Whither Farm Electrification?

IMPACT of the machine on agriculture appears in the declining ratio of farms to population —down from about 6 percent in 1920 to about 4 in 1944. While this ratio was going down, the national farm production index was going up from 92 to 136.

Farm electrification is large and looming larger in the machine picture of agriculture, as this issue of ELECTRICAL WORLD clearly demonstrates. Great as have been and will be the changes made by field machines, it is conceivable that intensive electrification will make even greater changes. This is because electricity is versatile; its energy masters a great many farm tasks. Also, with electricity, the preparation and processing of farm products can be performed to a much greater extent at the places of origin instead of elsewhere, as is so largely the case at the present time.

Machines have made it possible for farmers to cultivate more and more acres with less and less manual labor. Farm manpower grows in productivity as the result of improvements in farm machines. But most of this progress has been in field operations into which, as yet, electricity has made little or no advance. Its province is the vast amount of time-consuming muscle jobs around the barn and other buildings. Electricity can take over these jobs if all concerned in its application and promotion will strive to equal the achievements of the makers and promoters of field machinery.

At present there are several limitations on farm electrification. One is that many machines and equipments of its application yet remain to be invented and of those that are now to be had many can stand much improvement. Another limitation is that present energy supply facilities are not really adequate for intensive farm electrification.

A third limitation is imposed by the failure of those concerned with electrification to coordinate their promotional efforts. Much such effort is being exerted, but it is unorganized. A part of it is wasted because it is not upheld by parallel efforts of other equally concerned interests. The power companies push farm electrification. So does REA, the electrical manufacturers, and farm organizations. So does the U. S. Department of Agriculture, and many colleges and universities. So do all who have any interest in making the farm a better place for living and a more effective production unit. But they don't push together, not all together.

A coordinating agency is needed. A start toward such an agency was made last year in the formation of the National Farm Electrification Conference. As yet, the Conference has only a modest ambition—to bring together the various interests in the field to talk things over, each to learn what the other is doing. It should have a bigger purpose. It should aspire to be an organization for integration of all efforts to electrify the nation's farms.

★ ★ NEWS OF THE

Heat Pump Progress Slow Though Many Show Interest

Sporn of A.G. & E.S. Reports Present Status of Program —Manufacturers and Utilities Conducting Research—Some Firms Making Models Which Do not Meet Specifications

THOUGH the heat pump program has not advanced so rapidly as was hoped, it is gradually moving forward. Not enough time and effort have been expended by the whole electric industry in its development since the idea was first proposed 15 years ago; nevertheless, today an astonishing amount of interest is being shown by manufacturers, utilities, and home owners.

This is the opinion of Philip Sporn, who first discussed the potentialties of the heat pump for domestic use in a paper before the annual meeting of the Edison Electric Institute in 1944.

In a progress report written for ELECTRICAL WORLD, the executive vice-president of the American Gas & Electric Service Corp. said that following two meetings in 1946, the specifications for the manufacture of 1,000 heat pump air conditioners and 10,000 water heaters were sent to 70 electric utilities and utility groups asking that they participate in the program by committing themselves for a certain number of units. Sufficient pledges were received to allow the manufacturers to go to work on pilot models.

At the same time, the specifications were also sent to seven leading air-conditioning and refrigeration manufacturers with the request that they submit a proposal for designing and fabricating one pilot model of each of the air conditioner units and of the water heating units.

Of the two manufacturers who are proceeding with an active research and development program, one expects to have pilot models ready soon for field tests, and the other believes his models will be ready late this year or early in 1948. The other manufacturers approached have decided against any research or development work at present because of labor or other difficulties.

At least four other smaller companies are now manufacturing, or plan to do so, heat pump air conditioner units. These do not meet the specifications which have been prepared nor do they come up to the standards set by the electric utility industry for other energy consuming equipment. These units are in the most part an assembly of conventional refrigeration equipment now available on the market and not designed nor intended for year-round heat pump service.

The primary reason for the offer to purchase a large number of units as a part of the heat pump program was to encourage manufacturers to devote a substantial amount of time and effort in research, development, and design to produce a reliable and efficient self-contained heat pump unit.

Ten organizations are exploring the use of the earth as a heat source in connection with the heat pump. These are Commonwealth Edison Co., Chicago; Union Electric Co. of Missouri, St. Louis; Wisconsin Electric Power Co., Milwaukee; Pennsylvania Power Co., New Castle; Ohio Edison Co., Akron; Connecticut Light & Power Co., Waterbury; Texas Electric Service Co., Fort Worth; Indianapolis Power & Light Co.; the A. G. & E. system; and several companies in the Southeastern Electric Exchange group.

On the whole, the investigations being carried out by these utility companies are achieving few results, mainly because of the lack of a planned program, combined with the inexperience and lack of knowledge of the various factors involved by the investigators.

Several organizations are doing some research work on various phases of the heat pump under utility sponsorship. A group of the Southeastern companies have employed the Southern Research Institute to investigate the use of the ground as a heat source. Similar investigations are being carried on by Texas A. & M. College under the sponsorship of Texas Electric Service and by the University of Connecticut under the sponsorship of Connecticut Light & Power. These investigations should result in valuable data.

A Heat Pump Steering Committee, recently formed by E. E. I. and the Association of Edison Illuminating Companies, will coordinate present and proposed investigations of the heat pump and its uses.

Prediction Comes True in a Hurry

Before last week's edition of *Electrical World*, containing the prediction of James H. Polhemus, president of the Portland General Electric Co., that a curtailment of the aluminum industry would improve power conditions in the Northwest, was off the press, the Reynolds Metals Co. announced that it had suspended operation at its Longview, Wash., plant which produced aluminum ingots. The plant had a 60,000-kw. demand.

Tests on 2 More German Air Breakers Will Follow

A Siemens-Schuckert Werke 110-kv., 1,500-mva. expansion breaker is now being assembled preparatory to no-load tests under the supervision of Dr. W. M. Leeds, Circuit Breaker Development Section, Westinghouse Electric Corp.

In making this announcement this week, the office of Technical Services, Department of Commerce, also announced that it has received a third German breaker, S.S.W. 110-kv., 2,500-mva. expansion type, which will be given tests similar to those given the previous breakers.

The breaker now being assembled will be sent to the Bonneville Power Administration for tests similar to that made recently on the A.E.G., 220-kv., 2,300-mva. air-blast circuit breaker.

ELECTRICAL WORLD ★ ★

Reclamation Fund Slash Responsibility of Congress

President in Letter to Senator Wherry Supports Bureau Officials That Budget Was Under Ceiling

President Truman has tossed back into the lap of Congress the responsibility for curtailing construction by the Bureau of Reclamation during fiscal 1948.

In a recent letter to Sen. Kenneth S. Wherry explaining the two-year limitations he imposed on Reclamation construction work last summer, the President declared that "it is not anticipated that it will be necessary or desirable to place restrictions on the expenditure of funds available for fiscal year 1948."

Senator Wherry, chairman of the Senate subcommittee now studying the 1948 Interior Department Appropriations Bill, had asked the President to clarify the status of his "freeze orders" on public works expenditures as specifically applied to Reclamation Bureau work. Largely on the basis of these orders, which limited Reclamation Bureau expenditures to $130,000,000 for construction in fiscal 1947 and to $177,400,000 for all purposes in 1948, the House Appropriations Committee justified the drastic slashes it effected in the bureau's 1948 budget.

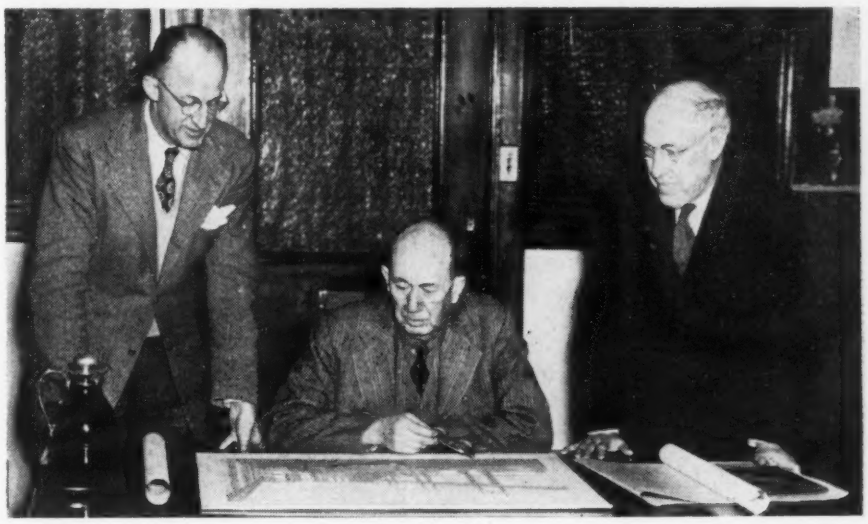
Budget Cut 47 Percent

The House group announced that in slashing the bureau's 1948 budget by some 47 percent it had considered unexpended funds previously appropriated and carried over by the agency. This carry-over, plus new funds, would give Reclamation more than $141,000,000 for construction during fiscal 1948, the House Committee contended. Only $5,175,000 for Reclamation projects was added on the House floor. However, Interior officials claim that a major portion of unexpended Reclamation funds are obligated by contracts let during fiscal 1947, thus considerably reducing the amount actually available for use during the coming fiscal year.

This position was defended by the President, who told Senator Wherry that the $177,400,000 ceiling contemplated for fiscal 1948 included estimates of all carry-over funds for Reclamation, plus the amounts approved by the Budget Bureau for the Agency's 1948 programs. Thus, in effect, Mr. Truman notified the Congress that the Bureau's budget was already within the "freeze order" ceiling before it was slashed by the House.

Meanwhile, Reclamation Commissioner Michael Straus, testifying before the Wherry subcommittee, declared that the bureau would have only $105,410,273 available in unobligated funds for construction work in fiscal 1948 from appropriations approved by the House. In estimating that the bureau would have a carry-over of $85,826,767 of unexpended funds plus $60,433,600 in new construction appropriations, the House failed to consider the agency's unpaid bills and funds earmarked for future projects, Commissioner Straus contended.

"It is evident," he added, "that the bureau will have insufficient funds, on a total basis, to meet its existing construction commitments, much less its additional budget-approved work program, under the House allowances."



STUDYING THE PLANS—R. M. Watt, seated, president of the Kentucky Utilities Co., looks over the plans for the 66,000-kw., $9,250,000 Green River steam plant to be erected near South Carrollton. Vice-President Washington Reed is at left, and Vice-President and Chief Engineer E. W. Brown it at the right

Ohio Tax Extended

Gov. Thomas J. Herbert has approved a bill extending for two years the 65-mill utility excise tax in Ohio. Funds will be used for poor relief and other welfare purposes.

February Wages of Utility Workers Up, Hours Down

In February, for the third straight month, average weekly earnings in the electrical machinery industry dropped, along with weekly hours, while hourly earnings rose slightly.

In the electric light and power industry, weekly earnings rose while the number of hours worked dropped.

Here are the figures, reported by the Bureau of Labor Statistics:

In electrical machinery, weekly earnings dropped from $49.13 to $48.57 to $48.05 in December, January, and February, while weekly hours also were reduced from 41.1 to 40.5 to 39.9. Hourly earnings went up slightly from $1.19½ to $1.20 to almost $1.20½.

In electric light and power, weekly earnings were $55.37 in February, $54.11 in January and $54.58 in December. For the same months, weekly hours were 41.6, 41.9 and 41.4, and hourly earnings were $1.352, $1.313 and $1.337.

February weekly earnings were 16.2 percent above 1946 in electrical machinery and 8.6 higher in electric light and power.

These earnings reflect only last year's first-round wage increases. This year's increases, most of which have come since February, are not included.

Public Utility Anti-Strike Law Passed in Missouri

Act Provides for Mediation Board, Compulsory Arbitration, Seizure of Utilities, and Stiff Penalties

Missouri has joined the list of states which have enacted legislation to outlaw strikes in public utilities.

The new law provides for a permanent board of mediation; specially appointed boards for compulsory arbitration; seizure by the state of utilities followed by penalties against unions, union representatives and workers for calling, inciting, or supporting a strike, and against utilities for lockouts or failure to bargain collectively in good faith. The courts are given the power to enforce by injunction or other legal remedy any provision of the act and any order of the governor made under it.

The act, strongly opposed by labor unions, passed both Senate and House with little difficulty. The penalty provisions were inserted at the request of Gov. Phil M. Donnelly, who in a personal appearance before the Assembly said that the measure without a penalty clause would be ineffective and unenforceable.

Under the act, which applies to all utilities except railroads and communications, the governor is to appoint a five-man mediation board whose chairman shall devote full time to the position. Two of the members shall represent labor and two management. The other member shall represent neither.

Contracts Must Be in Writing

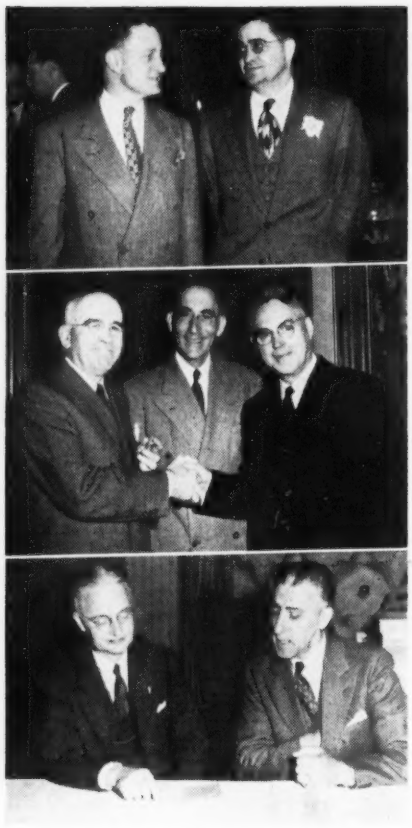
The duty of the board will be to mediate all labor disputes and it has the authority to appoint conciliators, call hearings, and compel attendance through the courts of persons and the submission of evidence. All contracts between management and labor are to be put in writing. Whenever any change is desired by either party, the board is to be notified 60 days in advance.

If after a contract expires (all are to be for at least a year) mediation has failed, management and the employees are each to appoint a representative. These two will appoint a third neutral party to compose an arbitration board. If either party fails to appoint a representative, the mediation board will make such appointment, and its appointment will be final.

The arbitrators are given 15 days in which to hold and complete hearings, though the time may be extended if both sides agree. An additional five days after the hearings are closed is granted the arbitrators, to notify the governor of their decision.

At any time a strike or lockout is threatened or is called, with or without notice, the governor has the right to seize and operate the properties involved until the dispute is settled. No employee, however, would be forced to work.

After the state has taken over, employees or their representatives are forbidden to strike or participate in any work stoppage to induce others to do so. Any employee who violates this portion of the act may go back to work only as a new employee. The union penalty is $10,000 a day, and union leaders can be fined $1,000 in all. For lockouts, utilities can be fined $10,000 a day, and for failure to bargain collectively in good faith with its employees, a utility can lose its certificate of convenience and necessity. All fines are to go to the Public School Fund.



NORTHWEST PERSONALITIES — Top, W. L. Thrailkill, Washington Water Power Co.; and Robert Sinclair, Pacific Power & Light Co. Center, Lewis A. Lewis, left, Washington Water Power; and A. Craig McMicken, Portland General Electric Co., the two oldest living active past presidents of the Northwest Electric Light & Power Association, join hands with President J. H. Polhemus, right. Bottom, Henry R. Kruse, Puget Sound Power & Light Co., and Howard N. Walters, British Columbia Electric Railway Co., chairman and vice-chairman respectively of the Business Development Section of the association at whose Seattle meeting these pictures were taken

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New Mexican Board Won't Buy Systems for 4 Cities

The New Mexico Rural Electrification Authority Friday rejected a proposal that it acquire electrical facilities of the New Mexico Public Service Co. for the cities of Albuquerque, Las Vegas, Santa Fe, and Deming. The board announced it had decided the 1935 law creating it did not authorize it to handle a deal of the type suggested.

The state REA, in a statement issued by the president, James Russell of Santa Fe, listed five reasons the board felt it could not agree to acquire the utilities:

1. It was not permitted under the law to acquire systems for resale or to act as a holding company for municipalties, either temporarily or permanently.

2. It could not acquire utilities except in areas where electric energy is not available at "reasonable rates"—and the State Public Service Commission has held rates of the company are reasonable.

3. Some phases of the proposal would contravene powers of the State Public Service Commission.

4. The plan was speculative inasmuch as its completion was dependent upon later popular votes.

5. The REA's authority is limited to acquisition of electric properties whereas the Public Service Co. also owns gas, water and ice facilities.

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Energy Output Up in March

Production of electric energy by electric utilities during March, 1947, totaled 21,245,914,000 kw.-hr., or only 1.8 percent less than the record of 21,636,260,000 kw.-hr. reached in January, 1947, according to a report issued by the Federal Power Commission. This is an increase of 19.4 percent over March, 1946, and is the highest March production total of record. Combined utilities and industrial production was 25,543,686,000 kw.-hr. during March, an increase of 17.8 percent compared with March, 1946. Production by water power in March amounted to 7,264,665,000 kw.-hr., or 34.2 percent of the utility total, in comparison with 40.9 percent of the total output in March of last year.

Electrical Equipment Group Studies Trends in New Plants

Pennsylvania Electric Association Committee Hears Utilities Inclining to Use of 13.8 Kv. as Generator Voltage—Design of Stations and Substations Discussed at Meeting at Dallas

TRENDS toward 13.8 kv. as a generator voltage and toward use of enclosed phase-isolation or Oilostatic generator leads were evidenced at a meeting of the Electrical Equipment Committee of the Pennsylvania Electric Association at Dallas, Pa., on May 15 and 16.

A symposium on station and substation design also recorded adoption of electronic and shaft-driven exciters, "voltage-chasing" schemes for auxiliaries, substation location to windward of stack and coal-pile, gas-pressure relays, linear couplers, pedestal-type outdoor step-down stations, and form-fit transformers.

Innovations and departures centered around several of the new plants in process in the area. Pennsylvania Electric Co.'s Warren plant will have full electronic excitation (including control) from a 6-phase ignitron rectifier fed by a 6-phase shaft generator, along with R.&I.E. phase-isolation generator leads. A diesel-electric set will back up the 180-ampere-hour Dubois automotive-type station battery, and the precipitator will be energized by a modified X-ray transformer, according to D. R. Pattison. He added that the main transformer will have gas-pressure relays, a measure prompted by experience with internal connections and tap-changers. Anti-freeze solutions will be placed in the common air system for pneumatic operation of breakers.

Four 2-million c.m. cables on ebony-asbestos spacers were found most economical for the Phillips addition, said J. S. Brown of Duquesne Light Co. Boiler auxiliaries are to be divided between two doubly fed buses and numerous small banks will minimize the cost of the 440-volt breakers. Better experience led to adoption of 125 volts for control circuits. Class B insulation is preferred, he said, for critical motors despite the plan for thorough plant ventilation to prevent hot areas. Cost, life, and reliability all favor forced cooling of main transformers.

The new General Electric channel-bus in square aluminum housing was indicated for Pennsylvania Power & Light's new Sunbury plant which will burn pulverized anthracite, river silt, or bituminous. Across-the-line motors of drip-proof design showed economies, said W. B. Morton. Control cables (mostly 250-volt) will have Neoprene covering. A new Elpeco design of 4-kv. leads to the auxiliary bus has a Micarta sheath over the copper tubing. Pedestal construction was chosen for the outdoor station, and linear couplers will be applied for differential protection.

Control for Mitchell plant will be fully centralized, said C. M. Skooglund of West Penn Power Co. Aluminum pipe on pedestals will be the 132-kv. design. Feeder breakers out of the plant will have reclosure and be supervised from Charleroi.

Barbadoes station of Philadelphia Electric Co. will have phase isolation from generator to transformers, reported B. R. Nevins, the small excess of cost being credited as insurance. Oil-filled reactors in the extended and sectionalized bus will be single-phase.

R. E. Neidig, Metropolitan Edison Co., described new two-tube rectifier and detector units for locating grounds and opens and disclosing foreign voltages on series street lighting circuits. It is insulated to 5 kv.

New designs of relief diaphragms were described by J. H. Chiles of Westinghouse Electric Corp. Ray Bell, Allis-Chalmers Manufacturing Co., presented a discussion of the band width problem in voltage regulator.

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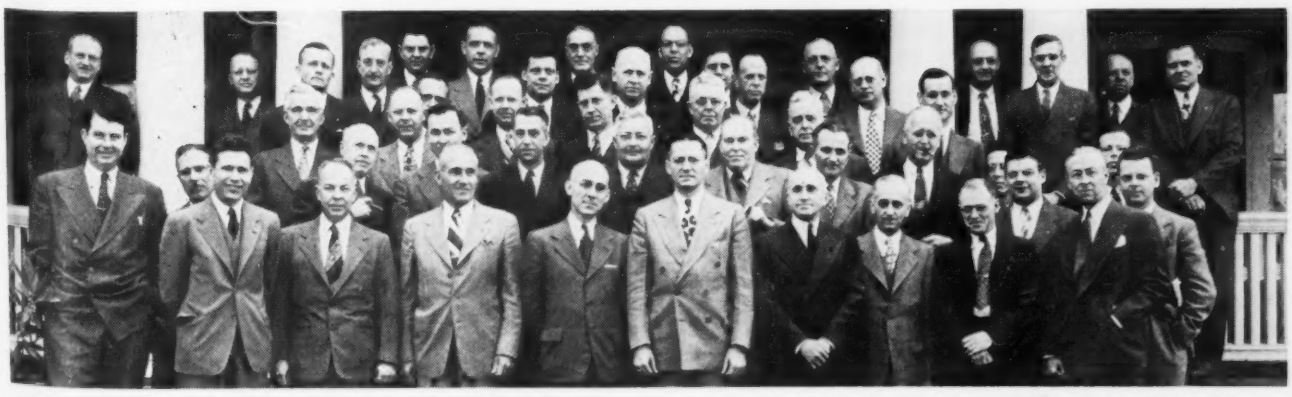
Supreme Court Refuses to Upset Foremen's Union

While Congress put the finishing touches on a labor bill which may make the whole issue academic, the Supreme Court this week again refused to upset a foremen's union.

The court declined to review an Appellate Court decision upholding the right of the federal government to recognize a union of supervisors in four seized coal mines. The case was one of two initiated by the Jones & Laughlin Steel Corp. in an effort to block unionization of its foremen in captive mines near Pittsburgh.

J. & L.'s second and more important case, contesting the right of the supervisors to organize under protection of the National Labor Relations Act, still is pending before the Circuit Court of Appeals at Philadelphia. Both legal tests began following the government's seizure of the mines in May, 1946. After the National Labor Relations Board certified the union as bargaining representative for the supervisors, the Coal Mines Administration signed an agreement recognizing the union for the duration of the government's operation of the mines.

Early this week House and Senate conferees still were ironing out their differences over two labor bills, one sponsored by Rep. Fred A. Hartley, Jr.,



ELECTRICAL EQUIPMENT IS THEIR FIELD—Members of the Electrical Equipment Committee of the Pennsylvania Electric Association and their guests at their meeting last week at Dallas, Pa.

and the other by Sen. Robert A. Taft. Both contained provisions denying Wagner Act privileges to foremen's unions.

The J. & L. cases are among the most significant of the recognized "tests" of the legality of foremen's unions. Last March, in another key case, the court extended Wagner Act protection to 1,100 supervisors of the Packard Motor Car Co. who had been organized by the Independent Foremen's Association of America. The latter verdict and this week's J. & L. case ruling have convinced labor observers that the courts will curb the unionization of foremen only if Congress enacts new law on the subject.

The J. & L. cases have been followed closely by electric utilities involved in disputes with organized foremen. The Packard case was considered by several utilities as an inadequate test of the issue (ELECTRICAL WORLD, March 15. Page 87).

The Supreme Court this week also upheld the right of industrial plant guards to organize bargaining units even when deputized by local police and to join unions which also represent production employees. These decisions were rendered in two cases, involving employees at Jones & Laughlin's Otis works in Cleveland and E. C. Atkins Co. guards at a tool and armor plate plant in Indianapolis.

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N. A. E. C. Reelects Officers; Cadwell Added to Board

All officers of the National Association of Electric Companies have been reelected. These include: President Purcell L. Smith; Vice-President A. C. Spurr, president of the Monongahela Power Co.; Treasurer R. Roy Dunn, vice-president of Potomac Electric Power Co.; and Secretary Arthur R. Barnett.

The following directors were elected for three-year terms: D. E. Ackers, president, Kansas Power & Light Co.; C. L. Campbell, president, Connecticut Light & Power Co.; J. G. Holtzclaw, president, Virginia Electric & Power Co.; P. H. McCance, president, Duquesne Light Co.; D. H. Mitchell, president, Northern Indiana Public Service Co.; E. R. Crofts, vice-president, Rochester Gas & Electric Corp.; H. B. Sargent, president, Central Arizona Light & Power Co.; C. J. Strike, president, Idaho Power Co.; and L. V. Sutton, president, Carolina Power & Light. Also elected to the board of directors for a term ending April, 1949, was H. J. Cadwell, president, Western Massachusetts Electric Co.

HOT COFFEE—Heavy snow and high winds recently kept the Electricity Supply Board's (Ireland) line crew working day and night to restore service. During power outages, hot coffee was served a la Homelite. The 2,500-watt generator, which ordinarily serves the crew by driving electric tools, this time made it posible to serve the inner man

Soft Coal Output Greater; Utilities' Reserves Smaller

Despite an increase in soft coal production of 36.2 percent over the corresponding period of 1946, electric utilities in several areas are beginning to show alarm over the rate at which their stockpiles are growing.

Statistics kept by the Federal Power Commission indicate that reserves held by electric utilities are not what they should be. As of April 1, utilities held 15,774,627 tons in reserve as compared with 17,260,588 tons on the same date last year. Based upon consumption rates for the two years, these stocks amounted to a 68-day supply in 1947 as compared with a 100-day reserve in 1946.

Behind the fears of the utilities is the possibility of a strike after June 30, the deadline for government operation of the mines. However, the prospects for averting a serious strike grew brighter last week when John L. Lewis and his United Mine Workers began conferring in Washington with owners of Northern and "captive" mines. If the Northern mines, which supply 70 percent of the total bituminous production, stay in operation, utilities will be assured of a supply for some time although eventually the loss of Southern production would bring curtailment of operations.

Any interruption of deliveries during the summer would seriously affect utilities in the Great Lakes area which depend on Lake shipping for fuel and must build up their reserves before winter ice severs their supply lines.

Several Eastern companies have reported that recent deliveries of coal have been under the amounts for which they had contracted with suppliers. One major company complained that its daily supplies were more than 25 percent below contractual commitments. Another disturbing factor was the rising cost of "spot coal," stocks bought on open market in addition to the supplies ordered under contract.

Somewhat puzzling is the failure of the stockpiles to grow with coal production to May 10 being 225,757,000 tons as compared with 165,789,000 tons for the corresponding period of 1946. At the present rate of production, coal output by June 28 will be approximately 309,000,000 tons as compared with approximately 235,000,000 tons in the first half of 1946. This would be an increase of 74,000,000 tons. Coal production in the first half of 1946 was greatly curtailed because of the six-week strike.

The effect of foreign exports on domestic stocks has also been discounted. But 3,000,000 tons were shipped abroad during March, according to government estimates. These figures do not include shipments to Canada, which has increased its imports during recent mine strikes in Canada and Newfoundland.

S.E.E. Power Salesmen Told of Hard Job Ahead

New Type of Selective Selling Needed In Market Where Sales Are Going Up and Rates Down

Selective selling which will be effective in the rapidly developing buyers' market and which will produce revenue in sufficient volume to cover financing of new generating and other equipment was the keynote of the Power Sales Conference of the Southeastern Electric Exchange held May 8-9, in Birmingham, Ala., with a record attendance of more than 150 utility men.

W. Paul Lyman, industrial sales manager of Carolina Power & Light Co. and chairman of the conference, said that a new appraisal is needed by the power salesman to solve the problem of rapid growth in sales at lower average rates, producing larger gross but smaller net revenue. Lyman said a new type of selective selling is needed to meet the highly competitive market which is approaching.

The tremendous market which is ahead in the South because of the industrial expansion program was emphasized by Les M. Taylor, vice-president of Mississippi Power & Light Co. Tracing the rapid growth of major industries in recent years, he declared that there must be a great increase in power capacity to meet demands as new plants come into operation.

1,500,000 Kw. for Southeast

During the next four years, he said, the Southeastern electric utilities will install 1,500,000 kw. of generating capacity to provide facilities for anticipated expansion, adding that about $350,000,000 has already been earmarked for new facilities. He issued a challenge to power salesmen to meet competition from other sources of power to make profitable the new investment in plant facilities.

J. R. Lester, manager of industrial development for Alabama Power Co., told of the operations and sales promotion work of his department in selecting the type of new industries which offer the best possibilities in the different areas to increase the economic potentials of the section and provide an outlet for additional power sales. He said that from 1925-1946 inclusive, there had been established in Alabama 510 plants in 173 towns and 61 counties, manufacturing 179 different products, having over 72,000 employees and $291,667,500 of capital invested. These plants, he estimated, use 156,201 kw. and 947,960,000 kw.-hr. annually.

Glenn D. Farrar, turbine specialist of General Electric Co., pointed out the different types and uses of turbines in industry and cautioned the conference that with a careful analysis of industries in any area it is possible for the power salesman to make a real contribution by persuading people to meet their electrical needs adequately and economically with the right product or service.

Tracing the rapid growth in diesel engines, L. V. Armstrong, Ingersoll Rand Co., said that the utilities have met the diesel threat by installing one or more diesels at the end of a power line which is already overloaded but which serves a territory where prospects of future growth in power use do not justify the expense of an additional power line. Other utilities, he said, are resorting to skid mounted units to take care of seasonal demands.

Armstrong said there is going to be a strong effort to keep busy the diesel manufacturing facilities, many built at government expense to take care of the needs of the armed forces. He said that pressure will be put on the sales departments and dealers to maintain rate of production.

SALES CONFERENCE—Utility representatives at Power Sales Conference of the Southeastern Electric Exchange. Left to right, W. Paul Lyman, Carolina Power & Light Co.; H. E. Cox, vice-president, Birmingham Electric Co.; T. L. Bissell, Alabama Power Co.; J. Mason Guillory, New Orleans Public Service, Inc.; and L. M. Smith, vice-president of Alabama Power

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Heating Drive On

A campaign to make Chattanooga, Tenn., the "all-electric" city of the country is being undertaken by the Chattanooga Electric Power Board, and it is estimated that the number of residences heated by electricity will be doubled. At present there are more than 500 homes using central electric heating systems. This is in addition to the five using reverse cycle home heating.

Senate Confirms Warne to Interior Secretary Post

Accepting a favorable committee report, the Senate last week speedily confirmed the nomination of William E. Warne as assistant Secretary of Interior. Appointed to replace the retiring Warner W. Gardner, Warne will continue to serve as Assistant Commissioner of the Bureau of Reclamation until July 1, when his predecessor will leave the department.

After serving a little over a year as assistant secretary, Gardner is resigning to enter private law practice in Washington. A graduate of the Columbia University Law School, he entered government service in 1935 as a member of the solicitor general's staff. After a brief tenure as solicitor of the Labor Department, he became solicitor for Interior in September, 1942. He spent two years in the Army as an intelligence officer, with overseas duty in France and Germany, and returned to his Interior post in October, 1945.

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Peak Loads Set March High

The aggregate of major electric utility system peak loads for March, 1947, totaled 41,661,000 kw., according to figures released by the Federal Power Commission. This was the highest March load to date. The March peak loads, totaling 15.9 percent higher than March of last year, were about 380,000 kw. below the previous month's total. Corresponding energy requirements for March totaled 20,890,000,000 kw.-hr., a gain of 18.6 percent over March of last year and well above the 19,240,026,000 kw.-hr. in the shorter preceding month.

Television Set Fee Added to Rates in Norwich, Conn.

What is believed to be the first instance of a television or "video" rider in a public utility rate schedule went into effect on May 1 on the system of the Norwich (Conn.) Gas & Electric Department in connection with a general cost analysis for gas and electric rate revision by the firm of William S. Leffler Engineers Associated, Noroton, Conn., which was conducted by E. Irvine Rudd, one of the associates.

The rider provides that where a television receiver is installed, as evidenced by the presence of a television receiving antenna, the charge for any part of the first 5 kw.-hr. per month is increased $1.26 net. ($1.40 gross with 10 percent prompt payment discount).

The background of the rider as related to the Norwich cost analysis is based on specific cost figures not as yet released from this utility system, of which Theodore Braaten is general manager. The Leffler organization states that load characteristics and some hypothetical cost figures demonstrate the equity and necessity of a monthly charge of not less than $1.25 to reach the minimum added demand costs of a 10-in. television set and the safe amount of added foreground lighting. The supplemental lighting is said to be necessary to avoid eye fatigue that otherwise is experienced from consecutive nightly exposures to the 84-ft.-lambert brilliance of the new video tube when viewed for periods of one to three hours.

More complete statement of the revision of the Norwich gas and electric rate schedules, in which the television rider is included, will be published in a later article. The revisions are intended to accomplish a more equitable distribution of costs as between gas and electric service and to collect from the various customer classes profits which are considered reasonable for each respective class.

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Nevada to Construct Own Generator at Boulder Dam

Legislation calling for the construction of a state-owned generator at Boulder Dam has been signed by Gov. Vail Pittman of Nevada. The act authorizes the Colorado River Commission to take the steps necessary to carry out the provisions of the act.

Tentative agreements call for construction of the generator by the Bureau of Reclamation. The cost would be repaid over a 20-year period from revenue obtained from power sales. The state has been allotted space for such a generator since the signing of the original Boulder Dam power distribution agreement.

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Hearings on Dondero Bill Are Scheduled for May 28

New impetus behind the Dondero Bill—to get the Interior Department out of the business of marketing electric power produced at Army-built dams—developed in the House this week. After more than a month of inactivity (ELECTRICAL WORLD, April 26, Page 37), the measure was scheduled for hearings before the Public Works Committee on May 28 and June 4 and 5.

There was no sign of similar activity in the Senate, where no companion bill had been introduced up to this week. With a late July or early August adjournment expected, Senate hearings in the near future would be necessary to ensure a final vote in that chamber before the close of the present session.

Rep. Dondero said that the House committee, of which he is chairman, decided to hold hearings despite the fact that it had not received reports from the administrative agencies consulted on the bill. Representatives of the Chief of Engineers, Interior Department, and Federal Power Commission will be asked to testify, he indicated.

MEETINGS

Previously Listed

Edison Electric Institute—Joint meeting of Meter & Service Committee with Committee of Metering & Service Methods of the Association of Edison Illuminating Companies, Detroit-Leland Hotel, Detroit, May 26-28; Annual Meeting, Hotel Traymore, Atlantic City, June 2-5

Pacific Coast Electrical Association—Annual Meeting, Mission Inn, Riverside, Calif., June 4-6.

American Society of Refrigerating Engineers—Spring Meeting, Hotel Alexandria, Los Angeles, June 9-11.

American Institute of Electrical Engineers—Summer General Meeting, Mount Royal Hotel, Montreal, Que., June 9-13; Pacific General Meeting, San Diego Hotel, San Diego, Calif., Aug. 26-29.

American Society of Mechanical Engineers—Semi-annual Meeting, Stevens Hotel, Chicago, June 15-19.

American Society for Testing Materials—Fiftieth Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, June 16-20.

Public Utilities Advertising Association—Annual Convention, Book-Cadillac Hotel, Detroit, June 18-19.

Canadian Electrical Association—Annual Convention, Algonquin Hotel, St. Andrews, N. B., June 18-20.

SEC RULINGS

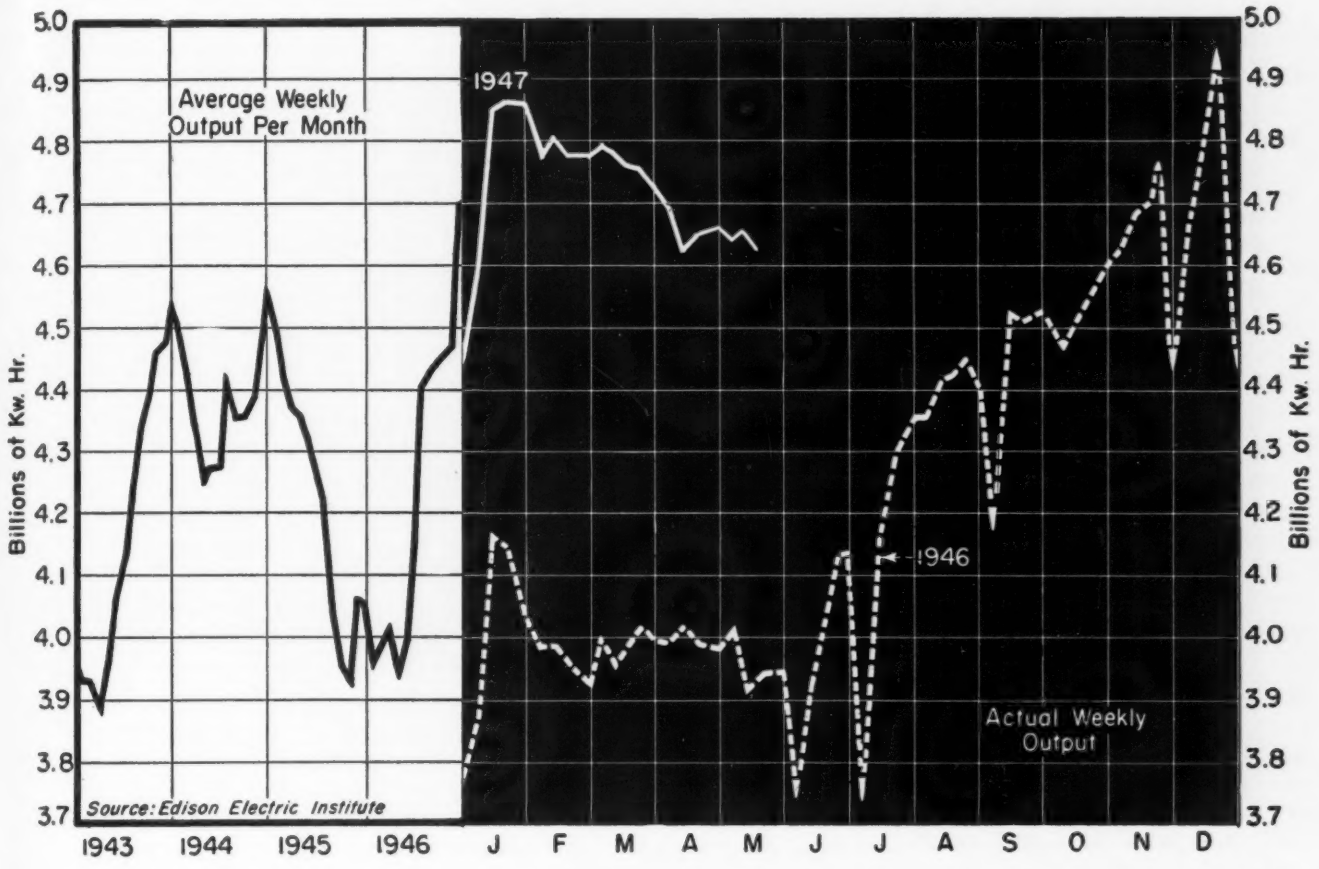
The Securities and Exchange Commission recently issued a series of orders affecting electric utility companies.

CITIES SERVICE CO.'s program for simplification of its corporate structure, involving the retirement of $100,488,300 of 5 percent debentures and elimination of preferred and preference stocks with dividend arrearages approximating $49,000,000, has been approved. Under provisions of the plan, $40,578,100 of the outstanding debentures, due 1950, will be retired at their redemption price with treasury funds, and a maximum of $115,246,950 of new 3 percent sinking fund debentures, due 1977, will be issued in exchange for all outstanding preferred and preference stock and in discharge of all claims to unpaid dividends. The plan contemplates that Cities Service will retire the balance of its 5 percent debentures, aggregating $59,910,200 with the proceeds from sale of its interests in the Toledo Edison Co., Ohio Public Service Co., Spokane Gas & Fuel Co., Federal Light & Traction Co. and Doniphan County Light & Power Co. Cities Service is required to divest itself of interest in these companies under orders of SEC (Release No. 7368).

ILLINOIS POWER CO.'s plan for use of the $11,300,000 it is to receive in settlement of claims against North American Co. and the latter's subsidiary, North American Light & Power Co., has been sanctioned. The settlement was provided for in Part I of Section 11 (E) plan of North American which the SEC approved on February 28 in a preliminary ruling and order. The commission will apply to a Federal District Court for approval of the settlement. If the court approves the settlement, Illinois Power will receive $6,800,000 from the transfer of the Central Terminal Co. securities and $4,500,000 from the issuance of 150,000 shares of common stock at $30 per share. Part of these sums would be used to retire its outstanding 483,195 dividend arrears certificates, each calling for the payment of $1.850, or an aggregate of $8,939,107, prior to the payment of any dividends on Illinois common stock. By eliminating the dividend arrears certificates in full, Illinois would clear the way for resumption of common stock dividends. (Release No. 7375).

AMERICAN POWER & LIGHT CO.'s proposal to sell privately for a minimum of $1,800,000 a 6 percent past-due note, issued to American by its subsidiary, Pacific Power & Light Co., has been approved. Originally in the principal amount of $3,194,500, there is now a balance due on the note of $1,794,500. Proceeds will be applied toward a capital contribution to Pacific in connection with the latter's reorganization and merger with Northwestern Electric Co., another subsidiary of American. (Release No. 7391).

AMERICAN GAS & ELECTRIC CO.'s proposed sale of 522,416 shares of common stock of Atlantic City Electric Co., at competitive bidding, has been approved. American Gas will dispose of its remaining holdings in Atlantic City, consisting of 627,584 shares of common stock, by distributing them as dividends to holders of its common in the second half of 1948. (Release No. 7394).



Secondary Boycott or No Westinghouse Votes C. I. O.

Unless some anti-boycott curbs are enacted into law, Westinghouse Electric Corp. may continue to face refusal by members of the International Brotherhood of Electrical Workers, A. F. L., to handle or install Westinghouse lighting fixtures made by workers in the Congress of Industrial Organizations.

The I. B. E. W's 18-month effort to convert C. I. O. workers in Westinghouse's largest lighting equipment plant in Cleveland to I. B. E. W. membership flopped miserably May 1 when the A. F. L. affiliate lost by a majority of more than 13 to 1 in a consent election held by the National Labor Relations Board.

The victor, United Electrical, Radio & Machine Workers, Local 777, C. I. O., gave credit for the victory to the Westinghouse wage settlement shortly before the election.

One I. B. E. W. official attributed the defeat not only to the wage increase, but also to the belief among the inside workers that Congress would pass anti-boycott legislation and thus render the I. B. E. W. boycott illegal.

This official also told a representative of ELECTRICAL WORLD that the I. B. E. W. has been "forced" into organizing electrical manufacturing workers and imposing such boycotts as exist against Westinghouse and generally in the New York area. He described it as a case of self-preservation against the onslaught of the C. I. O.

If the I. B. E. W. didn't assert its strength by refusing to install fixtures, produced by C. I. O. members, thus weakening the C. I. O. union, it might some day find the C. I. O. strong enough to reverse the boycott. That is, the C. I. O. might refuse to make fixtures installed by the A. F. L. Such was the reasoning of the I. B. E. W. official.

However, it was reported in Cleveland that the attitude of I. B. E. W. against Westinghouse has softened since publicity was given to the situation by ELECTRICAL WORLD in the April 5 issue.

U. E., which has held bargaining rights in the Cleveland plant since 1944, obtained 895 of the 1,994 votes cast. The I. B. E. W. got only 68, 19 were for neither, another 19 were impounded, and 3 were void. All but 153 of the 1,157 eligible employees cast ballots.

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Toronto Gets Paid

For the first time in its history, the Toronto Hydro-Electric Commission has made a payment in lieu of taxes to the city of Toronto. The payment, $134,798, was authorized under a recent amendment to the Municipal Act passed by the Ontario Legislature.

Output Moves Downward

The electric output curve moved downward during the week ended May 17, 1947, reaching the lowest point recorded since the first week of January. As reported by Edison Electric Institute, the amount of electric energy distributed by the light and power industry during the week totaled 4,615,983,000 kw.-hr., comparing with 4,653,137,000 kw.-hr. during the preceding week. For the corresponding week of 1946, the amount of energy distributed totaled 3,939,281,000 kw.-hr., this year's figure representing an increase of 17.2 percent. All sections of the country showed an increase.

Weekly Output, Millions Kw.-Hr.

1947		1946		1945	
May 17	4,616	May 18	3,939	May 19	4,377
May 10	4,653	May 11	3,911	May 12	4,302
May 3	4,640	May 4	4,012	May 5	4,397
Apr. 26	4,668	Apr. 27	3,977	Apr. 28	4,416
Apr. 19	4,660	Apr. 20	3,987	Apr. 21	4,411
Apr. 12	4,620	Apr. 13	4,015	Apr. 14	4,332
Apr. 5	4,693	Apr. 6	3,988	Apr. 7	4,322
Mar. 29	4,729	Mar. 30	3,992	Mar. 31	4,329
Mar. 22	4,759	Mar. 23	4,017	Mar. 24	4,402
Mar. 15	4,764	Mar. 16	3,988	Mar. 17	4,398
Mar. 8	4,787	Mar. 9	3,953	Mar. 10	4,446
Mar. 1	4,797	Mar. 2	4,000	Mar. 3	4,472
Feb. 22	4,778	Feb. 23	3,923	Feb. 24	4,474

Percent Change from Previous Year

	May 17	May 10	May 3
New England	+ 5.9	+ 8.5	+10.2
Mid-Atlantic	+ 9.2	+10.7	+ 8.3
Central Industrial	+18.9	+24.2	+17.3
West Central	+14.9	+13.6	+17.5
Southern States	+23.6	+23.7	+18.3
Rocky Mountain	+19.2	+20.1	+18.0
Pacific Coast	+19.1	+18.3	+18.7
Total United States.	+17.2	+19.0	+15.7

Defeat of Reorganization Plan Brings Court Action

6 Directors of Portland General Electric Charged with Contempt —Voting Time Extended to June 21

Charges that the Guaranty Trust Co. of New York influenced bondholders of the Portland Electric Power Co. in bringing about rejection of reorganization plans for the company will be aired in the United States District Court at Portland, Ore. Included in the inquiry will be charges that directors of the Portland General Electric Co., subsidiary of P.E.P., failed to cooperate with the court in the reorganization program.

After years of litigation under bankruptcy proceedings, a plan for reorganization of the company was approved by the independent trustees, the Securities and Exchange Commission, and the court. The plan then was submitted to security holders for their approval. By a large majority the share-holders indorsed the plan, but the bondholders rejected it by a narrow margin barely lacking the two-thirds majority required by law.

Balloting Ordered Reopened

Judge Fee directed that an order be drafted citing Franklin T. Griffith, E. B. McNaughton, Robert H. Strong, James H. Polhemus, Paul B. Wallace, and Ross B. Hammond, directors of Portland General Electric, to show cause why they should not be removed from the board and why each should not be punished for contempt.

Judge Fee also signed an order reopening balloting by security holders on approval or disapproval of the reorganization plan and extending the voting period to June 21.

Judge Fee cited the following charges as the basis for his action:

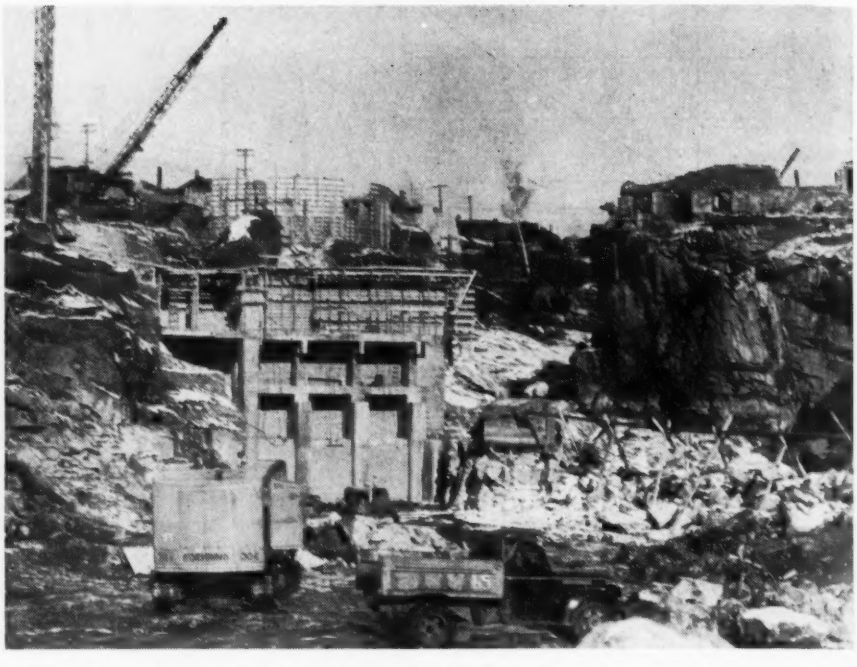
That Guaranty Trust and its vice-president, Henry A. Theis, issued false and misleading letters of advice to bondholders who were about to vote for acceptance or rejection of the reorganization plan, that the letter was not submitted to the court, and that the letter was issued without the court's knowledge.

That this letter of advice to bondholders was issued for the purpose of preventing favorable vote by the bondholders and with the intent and design to obstruct the process of justice.

That Guaranty Trust instructed its nominees on the Board of Directors for the Portland General Electric Co. to obstruct the process of justice in the proceedings and specifically influenced and required that the board refuse to declare a dividend on P.G.E. stock with the intent that the reorganization plan would be defeated.

That the P.G.E. directors accepted the advice of Guaranty Trust and failed to declare a dividend when the financial condition of the company fully justified such action.

Under the Court's order a hearing is set for July 23 on whether the plan has been accepted by the requisite amount and number of bondholders and stockholders. In the meantime, those who already have voted may change their minds and submit new ballots and those who have not voted may cast their ballots.



NEW HYDRO PLANT FOR NEW HAMPSHIRE—Construction work advances on hydroelectric project of the Public Service Co. of New Hampshire at Berlin on the Androscoggin River, where an 18,750-kva. generator is to be installed

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Municipal System Loses

Voters of Big Rapids, Mich., recently decisively defeated charter amendments which would have opened the way for the establishment of a municipal system. The city is now served by the Consumers Power Co.

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Anti-Strike Law Loses

A measure to delay strikes and lockouts in the public utility industry until the Illinois Commerce Commission would have a 60-day opportunity to bring about a settlement has been defeated by the Committee on Industry and Labor Relations of the Illinois House of Representatives.

Order Allocates Arizona Territory Between Utilities

A new order allocating territory between two competing electric utilities in the Yuma, Ariz., area—the Arizona Edison Co. and the California Electric Power Co.—has been adopted by Wilson T. Wright, chairman, and William T. Brooks, member, of the Arizona Corporation Commission.

The new order superseded one adopted last year before W. J. Eden was replaced on the commission by Brooks.

The order, Yale McFate, commission member, claims, gives the Arizona Edison Co. "a lot of rapidly developing territory" which it could not serve under the previous order. He said he had not been consulted about the new order and that he would write a dissenting opinion.

The two electric utilities have long been feuding over service rights in the Yuma district. Within the past year several opinions and orders concerning the issue have failed to bring the utility fight to a close.

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Unit to Follow Unit

Monongahela Power Co., which now has a 50,000-kw. unit under construction at its Willow Island plant, 6 miles south of St. Marys, W. Va., has announced that a second unit of the same size will be added immediately.

Electrical World OPINION

Rural System Planning

RURAL LOADS are just in their infancy—that is undeniable from the evidence in ensuing pages. Just as plainly, this means that the distribution systems to serve them are also in their infancy. Admittedly, thousands of miles have been built, many in anticipation of enough more load to be remunerative. On the maps, they look like rural systems; but are they truly rural *systems*, in the sense that they have been laid out and designed to be adaptable to the certain loads of the future? Too often their evolution has been like Topsy's—they "just growed." Allowed to persist, that treatment will lead to waste and grief not much different from the early days of a.c. distribution.

No one is going to be foolish enough to install wire sizes and transformers now for the loads of 1960. But that does not preclude a physical plan—a system plan, if you please—that will permit accommodating these loads when they do occur, with minimum disruption of what was initially installed. Already, unforeseen loads pop up at points on rural lines where they can hardly be handled without a major alteration. Welding establishments, small factories, cooler plants, service stations, etc., come on the line increasingly frequently.

Considerable parallel can be drawn between the rural circuits and urban circuits in these respects. To meet these problems in urban areas, system plans were instituted years ago. E. C. Stone, recently retired from Duquesne Light, was a pioneer in the movement. He tied together into one sensible pattern the technique of dispatching operations, the protective system, the avoidance of system instability, the fortification of the system for reliability purposes, the selection of the most advantageous form of distribution—all with a view toward the loads of the future as well as the present.

Such a program has to be based on competent forecasts of the load, on estimates of installed costs, on tolerable budgets. It was all pointed up in Stone's slogan—more system capacity per dollar of investment—because it could be *planned that way*.

Rural systems deserve to be planned, so that they too can meet foreseeable loads, can be modified inexpensively to meet the unforeseeable, can be fortified progressively to give better and better service, and can do it all with engineered economy of investment. Someone should emerge wearing Stone's mantle, cut to rural dimensions.

What About Young Men?

LIKE everyone else in the publishing business, ELECTRICAL WORLD has a rule against printing anonymous letters. Like everyone else, we break it, occasionally, as we have in "Letters to the Editor," page 202.

We broke it this time for several reasons. For one thing, anyone who knows much about the utility business will recognize that "A Well-Wisher of the Industry," as our correspondent signs himself, is reasonably well acquainted with the industry, not merely a pop-off exercising at once an American right and a warped personality.

Then again, we suspect that although there are many companies to whom every item of this scolding challenge will not apply, there are others who might benefit by it. It appears that one industry leader is about ready to talk bluntly about conditions of this nature which he finds—all too readily—in the power business.

Additionally, the topic is timely. In a recent issue, ELECTRICAL WORLD surveyed the industry's needs for young men—and found them great. The Edison Electric Institute, in its 15th annual convention a week hence, plans to devote considerable attention to the problems of the industry's younger generation. The national engineering societies are giving increasing attention to this problem.

Finally, we broke our rule against anonymity because of the urgency of the industry's situation with regard to young manpower today. In ELECTRICAL WORLD's May 10 issue was printed an article pointing out the need for additional young engineers. It found that between now and 1960, utility engineering staffs must hire 50 men for every 100 men now employed. Young men who enter the industry now should avoid much of the waiting-for-the-next-man-up-to-die which unfortunately has been too characteristic of public utility employment.

Our correspondent may or may not have overstated. But his comments are timely and provocative.

Allow Him His Grin

SEE that fellow over there snickering coarsely behind his hand? He's a power company man. He's having a nice chortle all to himself. In his newspaper he has just read that Mr. Truman is calling cabinet meetings to discuss high prices and how to get them down.

For 20 years or so, thundering allegations of too-high rates for electric service have been hurled at his unhappy head. To hear them, one would think that only one thing kept this land from approximating Utopia—the high price of a kilowatt-hour of electricity. Useless it was for him to point to the record of long years of con-

stantly decreasing rates. No matter how small the price of a kilowatt-hour, it was still too much.

Now business generally is under Presidential attack for its high price levels—by an administration which abetted the post-VJ-Day "first-round" of wage increases, and which, through its European relief-buying and farm-price-support policies, has exerted an incalculable effect upon food prices, most important in Everyman's budget.

Business, of course, doesn't like it, justifiably so, even though it does not have as steady a record of price reduction as the electric power industry.

But business generally can look forward to one thing. Ultimately, today's price vendetta against it will die. And in the calm that will then prevail, the electric power industry, doubtless, will still be reminded continuously of the "cheap" public power which can be had from interest-free, tax-exempt federal investment.

A New Federal Power Commission?

"WHILE much has been accomplished in the coordination of federal power construction activities through the effective cooperation of the agencies concerned, there seems to be evident a need for Congress to develop a more consistent pattern for . . . some of these important aspects of federal power project operation and administration."

That's no utility man speaking, it's Chairman Nelson Lee Smith, of the Federal Power Commission. It wasn't told to an electric utility convention, but to the National Rivers and Harbors Congress. Smith added:

". . . the Federal Power Commission is not a protagonist of either type of (power) development as such . . ."

Coming whence and as they did, these comments should raise many an eyebrow. Actually, they are but highlights among highlights of a speech which ought to be read and re-read throughout the entire power business.

Two things are pretty inescapable in Smith's speech. The first is one ELECTRICAL WORLD long has been mentioning—that Congressional review of the nation's power policy is necessary. We even believe it inevitable.

Equally inescapably, FPC no longer is dominated by vengeful spirits which want to thrash the power companies in the law courts, in the regulatory chambers and before every audience offering a forum. In 52 months, the private power business has changed from that great "devil of self-interest," as one FPC chairman put it, to an institution about which another can say, as Smith did:

"Our (the nation's) position of great leadership in this (power generation) field is attributable, not simply to our vast natural resources, but no less to the ingenuity of our people, the efficacy of our system, and the vision of our leaders, both in industry and government, who have made possible our unparalleled power development."

Electric utilities are engaged, presently, in a campaign to speed and to guide the revision of U. S. power policy. Isn't it about time for the industry to review its policy regarding FPC?

WASHINGTON COMMENT

By R. N. LARKIN

THOSE in the electric power industry who have felt it unnecessary to pay much attention to the Federal Power Commission must look again. Gas problems still predominate on FPC's docket, but increasingly, power considerations are resurgent.

For some time conciliation and cooperation by responsible FPC people have been evident. There have been numerous drastic shifts in Commission membership and its politico-economic line-up.

To the politically minded, the recent appointment of Burton Behling—to replace Commissioner Sachse and for a full five-year term as well—is fascinating. Behling was nominated as "without political affiliation." He has been registered Republican, Democrat and "no affiliation," which last, in suburban Washington, is commonly regarded as Republican for obvious reasons. This would establish G.O.P. control of an agency which is in fact an arm of the Democratic administration, and must be causing loud cries of pain from the swarm of lean and hungry Democrats who abound in Washington these days, what with last fall's election results and the existing reign of terror on executive appropriations.

Within FPC, one sees now a new line-up. Behling, a protege of Chairman Nelson Lee Smith, probably will follow him more or less closely. This alliance could be the converse of that which existed between former Chairman Olds and former Member John Scott, both of whom generally disagreed broadly with philosophies prevailing in the industries they regulated.

It's going to be hard to comprehend FPC thinking, without a thorough knowledge of Chairman Smith's recent address before the National Rivers and Harbors Congress. Smith pointed out certain discrepancies in existing U. S. power policy, suggested the urgency and nature of some major improvements, and told the privately owned power business that it has an obligation to cooperate wholeheartedly in whatever rational program the government may develop. Through it all, Smith suggested that FPC logically and capably could effect much of whatever reorientation of power policy Congress may institute.

Not all of Smith's points are entirely valid; but those who recall earlier days—the legal doctrines which invariably were diametrically opposed to the concepts of the industries being regulated, the bitter, vindictive attacks on them by Commission members, the over-riding of state regulatory wishes, the miscalculations on war power supply—will recognize considerable change. True, such a gap is less easily spanned by the victims than by the perpetrators; but many things indicate that FPC, at least, has negotiated the transition and is actively anxious that the power industry do so, as well.

Farm Electrification

THE INDUSTRY'S NEXT OBJECTIVE

FRANK R. INNES, Associate Editor, and

JOHN D. WILSON, Economics Department

ELECTRICAL WORLD

MAN'S OLDEST INDUSTRY is in the midst of a revolution. Farm economics and farm techniques have undergone a radical change in the short course of a decade. And the next few years promise to unveil changes of an even more lasting significance. The force behind this next advance will be electricity.

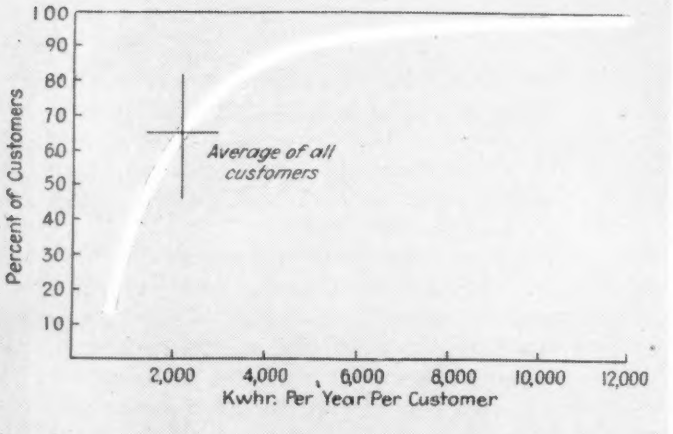
For the past ten years utilities and government have been busy with the job of connecting farms to power lines. Soon this task will be completed—no longer than five years should be needed at the maximum. Thus far the big push behind farm electrification has been social in character. Electricity has brought a better life to the farm home. Of secondary importance has been the use of electricity on the business side of farming.

It is this conception of the role of electricity in relation to the farm that is undergoing tremendous change. Electricity is to be applied to the farm as it has already been applied to industry. Costs are to be lowered, output is to be increased, quality is to be improved. And not the least important—much remaining drudgery is to be removed from farm work.

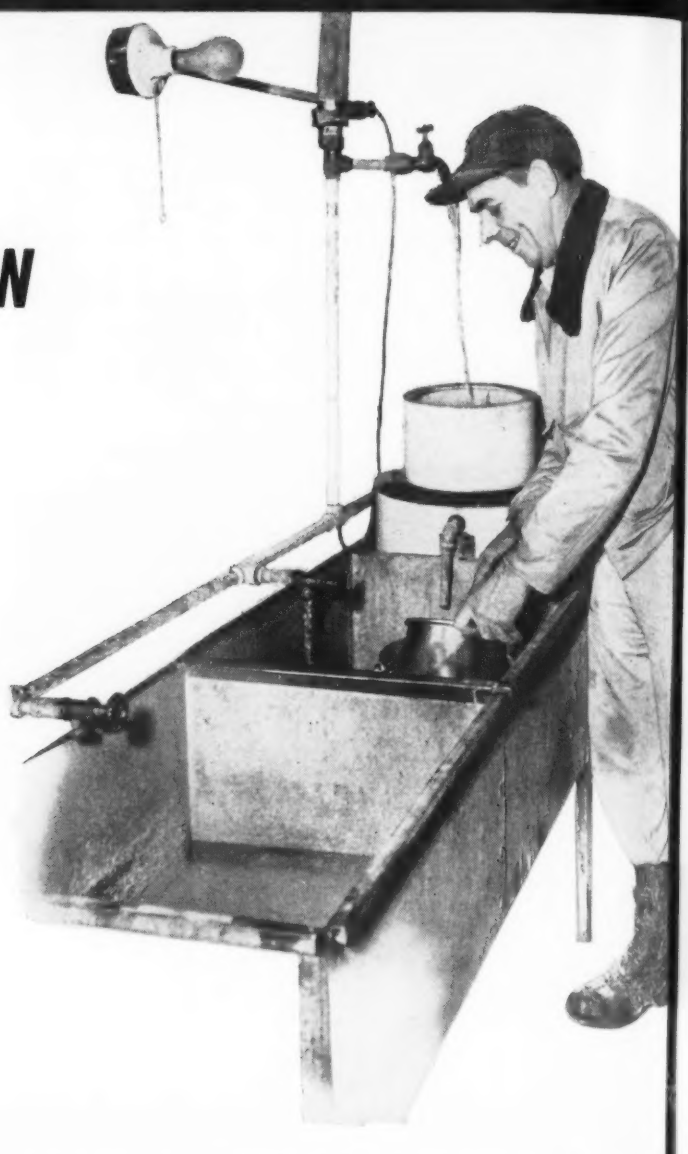
The following pages survey farm electrification from the point of view of this broader task—the industrialization of farming. The discussion falls into four main parts: an over-all view of farm electrification, including the economic factors that now encourage it; the many applications of electricity to farm operations and their value; the organization for selling farm electrification and marketing its equipment; and some considerations in regard to the supply of electric service.

First, and most important, use of electricity on the farm is for lighting, as it is in the factory, store and home

THE OVER-ALL VIEW



In an area in which, for today, farm service is conspicuously well developed, one-third of the farm customers use two-thirds of the electricity sold to all. Curve shows proportions of farm customers who use less than the annual kw.-hr. indicated



Instant hot water, electrically heated, is this farmer's effective dairy helper. Clean utensils and clean udders—washed with warm water—are cheap insurance of milk quality

There's a far-reaching revolution going on in U. S. farming. It may not be noticeable to the casual observer. But like all economic upheavals it's written in the statistics. And these tell a dramatic tale—a story of increased output and income with fewer farms and even fewer farmers.

In back of this advance is the substitution of mechanical power for human and animal muscle. This process is nothing novel in itself; it has been going on for more than a century. But it is now being accelerated by the force of central station electric service, the same force that has done so much to raise the efficiency and productivity of industry.

Electricity is becoming a vitally important farm hand rather late in its life. Industry, trade, and transportation had all made wide use of electric power long before it touched the business of farming. Not until the thirties did electricity begin to reach a large number of farms. And the motivation then (and to a large degree now) was the desire to improve living standards on the farm.

Whatever the cause, the fact is that electricity is now distributed to about 57 percent of U. S. farms, and electricity is available to another 13 percent of farms that are within ¼ mile of present lines. Thus farm electrification coverage now amounts to 70 percent. The private utilities and REA together have plans for extending service to about 800,000 more farms by the end of 1948. By 1952 or perhaps even earlier the job of farm line building should be substantially completed.

But the connecting of farms to power lines is only the beginning of farm electrification. Once electricity arrives at a farm, its employment as an aid to production becomes a matter of the economics of its application and of education of the farmer in its uses. This is a time consuming process upon which the nation, for all practical purposes, seems only now at the beginning.

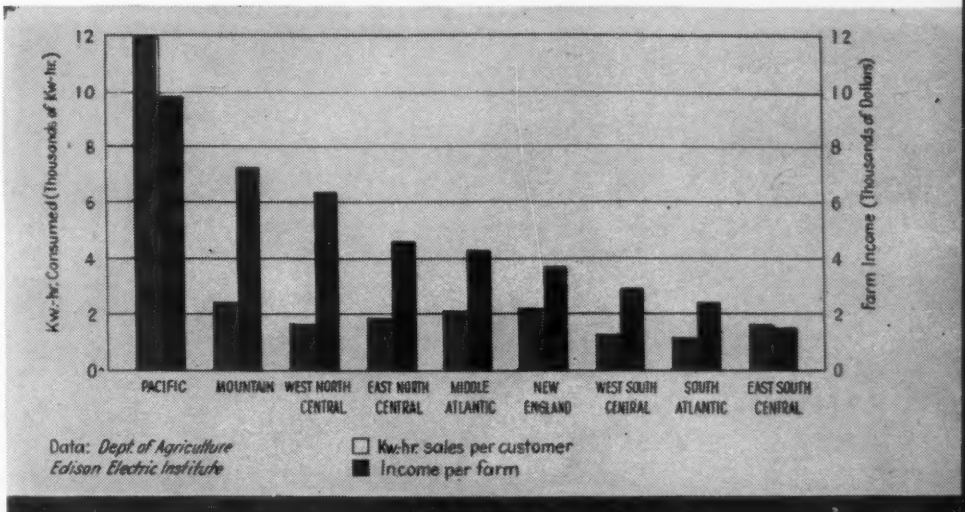
During 1946 farm customers in non-irrigation areas consumed on the average some 1,669 kw.-hr. This was more, but not as much more as the possibilities justified,

than the average kw.-hr. sales to urban households. It did represent, however, a doubling of consumption per farmer over the past decade. Moreover, of the total use of electricity at least 60 percent was consumed in the home. Average consumption on the business side of a non-irrigated farm thus amounted to a pitifully small 667 kw.-hr. From these facts, plus the information on farm equipment set forth later in this review, it is clear that U. S. farms have barely started to exploit the profitable uses of electricity that are available to them.

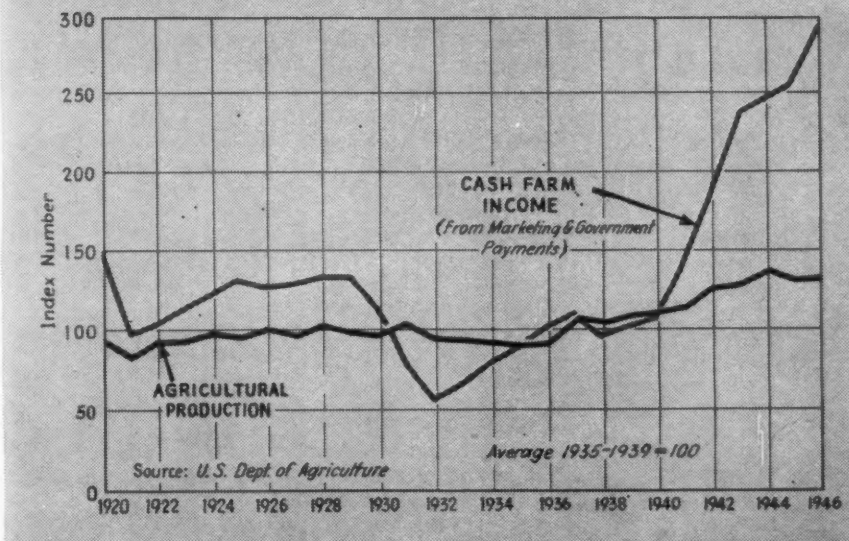
The Record of One Utility

This is a conclusion shared even by companies that are old, experienced, and successful hands at the business of farm electrification. Consider the case of the Public Service Co. of Northern Illinois, which is representative of utilities that have done excellent work in this field. In 1930 this company served 26.8 percent of the farms in its area. By 1946, 98 percent of these farms were numbered among its customers. Moreover, average kw.-hr. consumption in the same period expanded fourfold. And the annual sale per farm of approximately 2,800 kw.-hr. approached twice the national average. Even so, this company faces a challenging task and a great opportunity to enlarge the market for electricity on the farms of its region. For one-third of its farm customers now buy about two-thirds of the electricity sold to all. While the company most certainly does not expect to neglect those customers who already are heavy consumers, it regards its big job as one of helping the 67 percent of its customers who take less than 2,800 kw.-hr. per year and whose total purchases add up to only one-third of its farm sales.

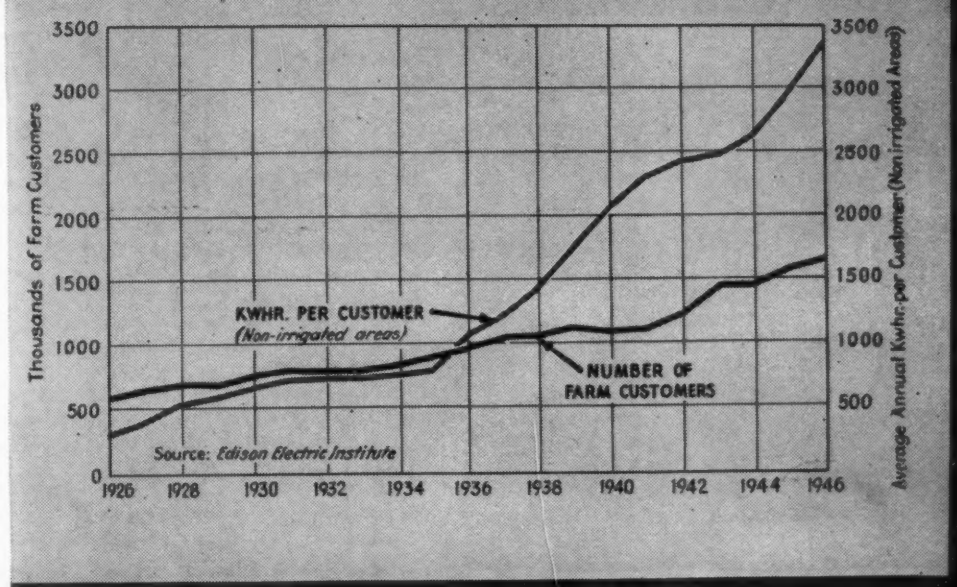
Those whose business it is to survey carefully the future of farm electrification throughout the nation believe that the growth in energy sales to rural consumers over the next few years can be considerably speeded. The foundation for their optimism is economic. For the successful farmer today is essentially a businessman, running a sizable operation, whether he appreciates it or not. To do it efficiently he



Farm income and electricity usage by regions



The new level of farm income in relation to farm production



Growth of energy usage by, and numbers of, farm customers

THE JOB OF FARM CONNECTION

About 70 percent of all farms now are within ¼ mile of a power line. But only 57 percent are actually connected with electricity. For every four farms that use electricity, there is one that can have it but is not connected. The backbreaking part of the task of bringing electricity to the farms of America has been largely completed. There remains the cleanup job. This in itself is not easy. On the whole it is the more remote and the less prosperous farms that now lack access to electric power. The electric utilities and REA aim to connect some 800,000 or more farms in the next two years and to push the power line frontier further into the back areas. By 1952—five years hence—electricity should be available to substantially all farms in the nation. Here is the current line-up by states.

State	Number of Farms (1945 Census)	Number Connected with Electricity (Dec. 31, 1946)	Farms that can be but are not connected (Dec. 31, 1946)	Farms not reached by power lines
Alabama	223,369	94,300	46,800	82,269
Arizona	13,142	10,900	400	1,842
Arkansas	198,769	68,300	43,600	86,869
California	138,917	120,500	6,600	11,817
Colorado	47,618	29,700	1,200	16,718
Connecticut	22,241	21,100	1,000	141
Delaware	9,296	6,400	1,600	1,296
Florida	61,159	30,400	13,000	17,759
Georgia	225,847	103,100	41,900	80,897
Idaho	41,498	35,400	300	5,798
Illinois	204,239	139,800	22,000	42,439
Indiana	175,970	141,200	17,500	17,270
Iowa	208,934	159,900	5,000	44,034
Kansas	141,192	53,600	12,400	75,192
Kentucky	238,501	90,500	38,200	109,801
Louisiana	129,295	54,700	38,000	36,595
Maine	42,184	30,000	3,500	8,684
Maryland & D. C.	41,315	29,800	6,100	5,415
Massachusetts	37,007	34,500	1,000	1,507
Michigan	175,268	157,500	7,000	10,768
Minnesota	188,952	108,700	18,300	61,952
Mississippi	263,528	75,100	85,400	103,028
Missouri	242,934	107,400	33,800	101,734
Montana	37,747	14,100	1,800	21,847
Nebraska	111,756	43,500	9,500	58,756
Nevada	3,429	1,700	200	1,529
New Hampshire	18,786	16,500	1,100	1,186
New Jersey	26,226	24,700	700	826
New Mexico	29,695	10,400	2,700	16,595
New York	149,490	137,200	5,600	6,690
North Carolina	287,412	141,300	58,100	82,012
North Dakota	69,520	8,800	3,000	57,720
Ohio	220,575	189,400	11,600	18,675
Oklahoma	164,790	69,000	23,900	71,890
Oregon	63,125	56,600	500	6,025
Pennsylvania	173,267	139,700	19,300	14,267
Rhode Island	3,603	3,300	100	203
South Carolina	147,745	67,900	38,600	41,245
South Dakota	68,705	10,100	3,700	54,905
Tennessee	234,431	88,000	37,700	108,731
Texas	384,977	210,400	63,400	111,177
Utah	26,322	20,400	600	5,322
Vermont	26,490	23,600	1,800	1,090
Virginia	173,051	84,300	33,100	55,651
Washington	79,887	76,000	500	3,387
West Virginia	97,600	48,000	7,700	41,900
Wisconsin	177,745	141,700	18,000	18,045
Wyoming	13,076	6,300	200	6,576
U. S. Total	**5,859,169**	**3,335,700**	**789,300**	**1,734,169**

Data: Dept. of Agriculture, Edison Electric Institute.

must constantly be on the lookout for ways to cut costs.

The extent to which farming has become big business is readily evident from even a casual examination of the farm census of 1945. Over half of all farm land now lies in farms with 300 acres or more. And farms with more than 1,000 acres claim 40 percent of the total farm acreage. Moreover, just an average Iowa farmer with only 160 acres has an investment in machinery, buildings and other items that adds up to a replacement cost of some $33,000, and this does not include the value of his land.

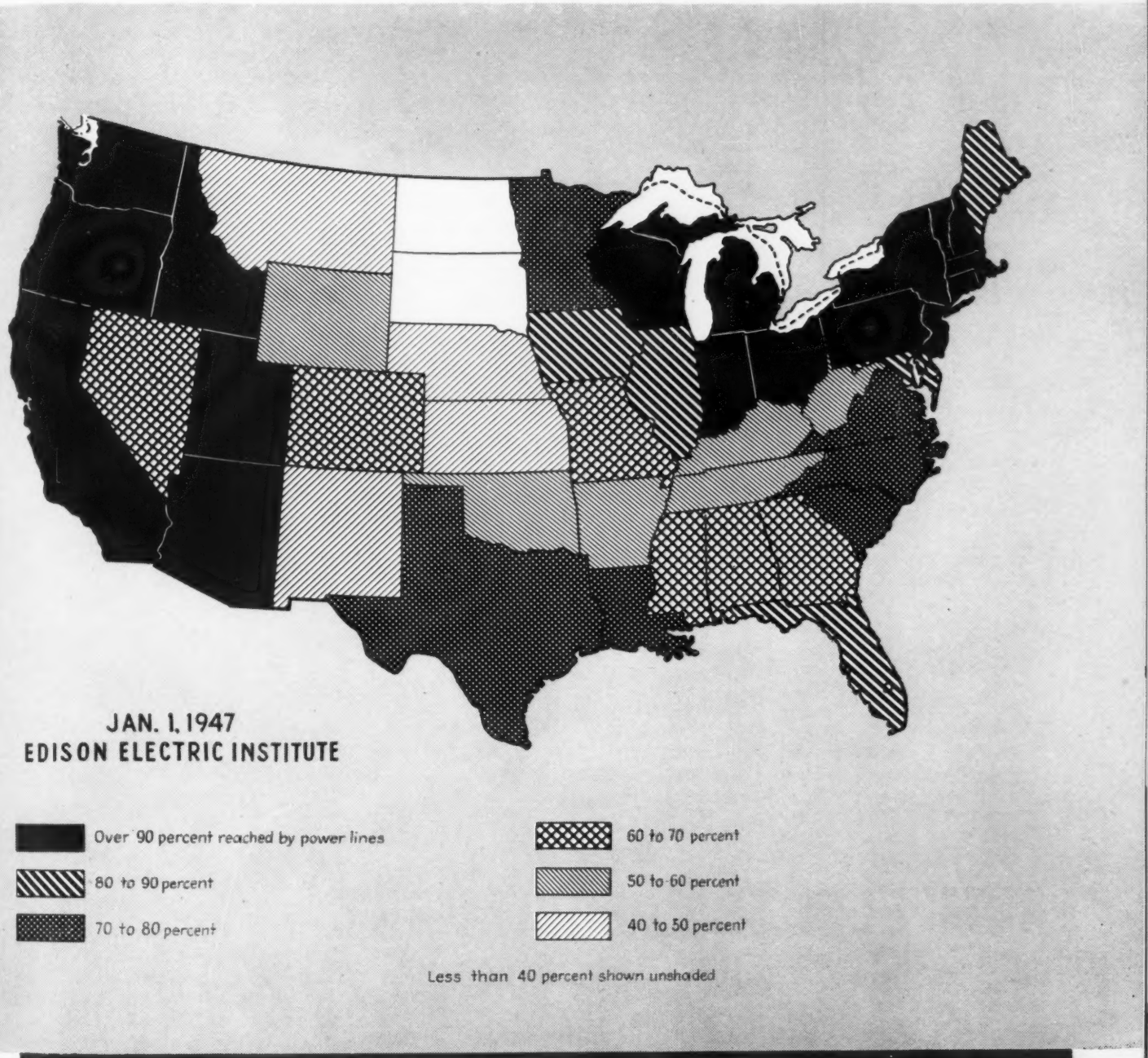
The farmer who wishes to cut costs with labor saving devices finds himself in a better financial position to do so today than at any other previous time. The war period was one of great prosperity for farmers. Cash income of farm operators rose from 8.7 billion in 1939 to 21.6 billion in 1945. And the upsurge of prices last year pushed this sum to 24.8 billion in 1946. On a per capita basis, farmers have experienced the greatest gain in income of any group in the nation.

Can't Hold It All

Not all of this rise in income can be held. The advance in over-all farm output, which amounted to about 30 percent between 1939 and 1946, will not be lost. One of the end results of farm electrification will be to expand output still further. But a decline in farm prices is inevitable, and this cannot help but reduce farm incomes. The farmer's recourse then must be a reduction in production costs.

Of course, no one expects farm prices to collapse as they did after World War I. Government supports will limit any near term decline to about one-fourth below the 1946 peak. And it is unlikely that the government will permit any further reduction of a substantial nature to develop thereafter.

But even a fall in prices as limited as this must lead farmers to explore further ways to reduce costs. Labor costs in particular have skyrocketed—the index now stands at 380 (1910-14 = 100) in contrast to a level of 123 in 1939. And these labor costs are unlikely to move back down to the same ex-


JAN. 1, 1947
EDISON ELECTRIC INSTITUTE
Over 90 percent reached by power lines
80 to 90 percent
70 to 80 percent
60 to 70 percent
50 to 60 percent
40 to 50 percent
Less than 40 percent shown unshaded

Availability of electric service to American farms. Map shows, by states, proportions of farms served plus those not connected but close enough to lines that service can be given if farmers want it.

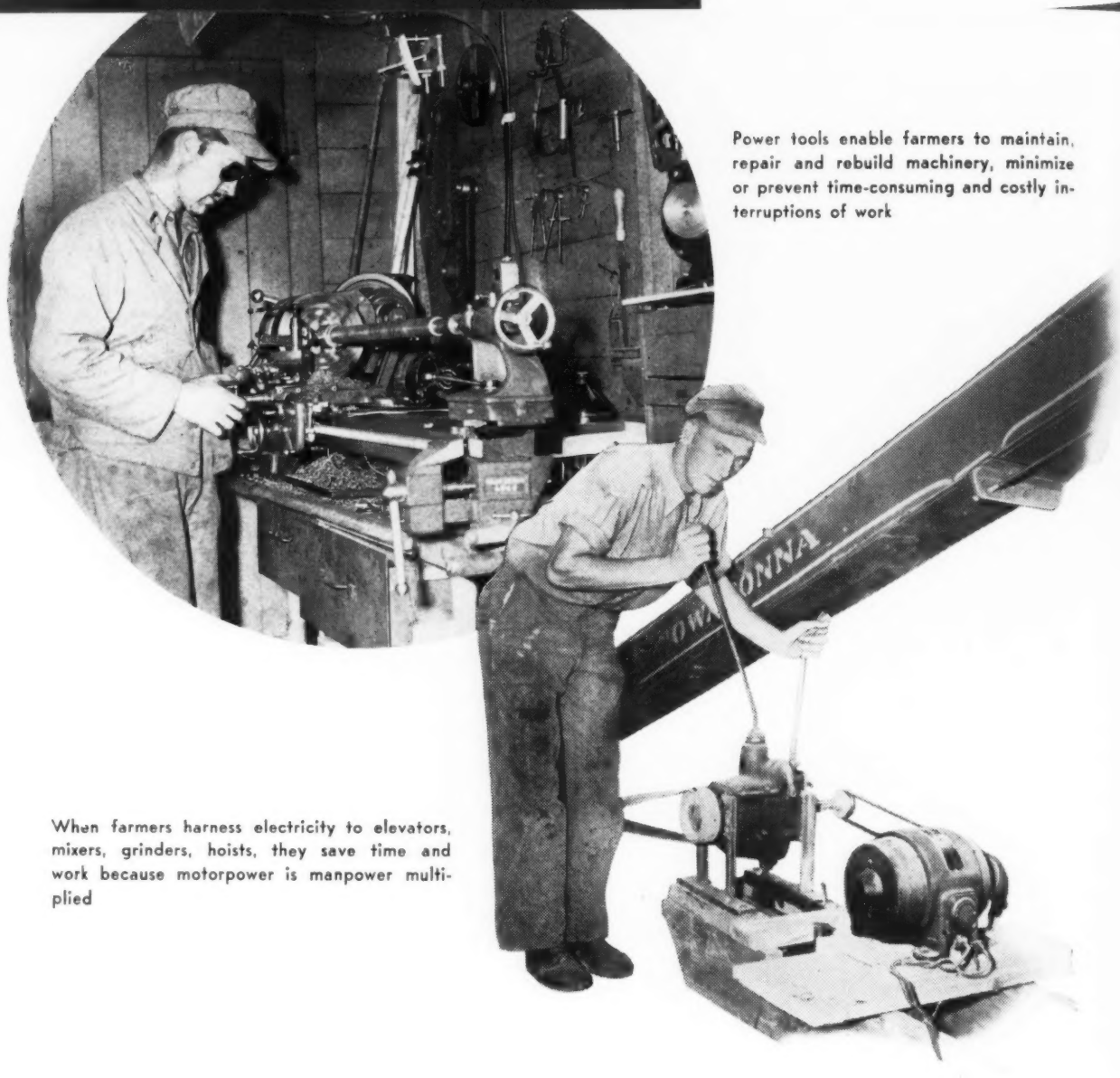
tent as prices of farm commodities.

With farm labor costs now more than three times what they were in 1939, and with no prospect that they will decline significantly in the immediate future, the farmer faces the same necessity that confronts industry—labor productivity must be raised. For this, he needs, he must have, the help of electricity.

As a result of their war-time prosperity, many farmers now find themselves in an unusually good position to afford some of these cost-cutting electrical improvements. Financial assets held by farmers increased tremendously between 1940 and the spring of 1946, a fact revealed in the following statistics.

	1940	Spring 1946	% Change 1940-1946
	—Billions—		
Deposits and Currency..	$3.9	$14.0	258
U. S. Savings Bonds....	.2	5.0	2,400
Other (in co-ops).....	.7	1.0	42
Total	$4.8	$20.0	316

To this sum should be added another several billion of estimated savings out of the record farm income of the past year. Moreover, still one further aspect of the farm financial picture is deserving of favorable mention—the reduction in mortgage debt from $6.6 billion in 1940 to about $5.2 billion now. In terms of ability to make the investment in it, the American farmer is ready for electrification of his production operations.



Power tools enable farmers to maintain, repair and rebuild machinery, minimize or prevent time-consuming and costly interruptions of work

When farmers harness electricity to elevators, mixers, grinders, hoists, they save time and work because motorpower is manpower multiplied

FARM ELECTRIC EQUIPMENT

Its Use and Values

Farmers must cut costs if they are to maintain their higher incomes of recent years. They must turn to mechanization to do so. Fortunately, they are financially in position to extend mechanization to new fields.

One of the principal goals of mechanization is to save labor and time. The average farmer spends about one-third of his time working in and around farm buildings. On dairy and poultry farms this time in and around buildings jumps to the high average of 80 percent. It is to a wide variety of these routine tasks that electrically powered mechanical devices, with all of their possibilities of automatic and unattended operation, can be applied.

A large number of such devices have been developed. Some, like the milker and feed grinder, have been employed for many years. Others, like the barn hay drier and the barn cleaner, are relatively new. A group of some 150 different uses for electricity in productive equipment on the farm are listed on page 119.

This list appears more impressive than it actually is. No farm employs electricity in these many ways; no one type of farm uses them all; few farms use any significant number of them. Nor has the equipment for these farm uses been developed to the same point of efficiency as has industrial equipment. Much farm equipment that now exists can be extensively improved. Designs can be simplified, efficiency of operation can be stepped up, and prices can be lowered. A great potential lies in the development of new types of equipment—types that can be turned out economically as larger markets for them are assured.

Many different groups are teaming up in an intensified drive to improve old and develop new electrical equipment. Electrical and farm equipment manufacturers, universities, government agencies,

agricultural associations, power companies and REA cooperatives, all have a finger in the pie. Nor are devices that save labor the only goal of these researchers. The use of electricity in improving quality and quantity of the product is an aim of equal importance. Bactericidal lamps to control disease, electrical applications to control insects, electrical heating and ventilating equipment for poultry and livestock, electrical equipment to cure, and to reduce deterioration of, harvested crops—these are only a few of the fields of current investigation.

Those whose job it is to sell these enlarged supplies of electrically powered equipment to the farm have one great appeal. They can in practically every instance show that the machine not only makes life easier, but it also yields an enlarged money income.

Pay-as-You-Go Plan

This economic basis for each individual piece of equipment is something that researchers have under continuing study. For example, to ascertain in a specific case the economics of farm electrification and its impact on labor saving and lower production costs, the Westinghouse Electric Corp. is carrying on a research project, in cooperation with the Ohio Public Service Co., on the Joseph Motz farm near Warren, Ohio. Mr. Motz is paying all power and equipment costs out of his income on a pay-as-you-go-basis.

Records so far have shown that in slightly over two years, the Motz farm, with a relatively small amount of electrical equipment, has saved 540 man-hours a year that have been used in other work. This has permitted the dairy herd to be increased from 16 head to 30 during the first 20 months, resulting in an increased income with no increase in labor.

It is not yet possible to catalogue in dollars and cents the advantage to a typical farmer of every type of equipment. And of course conditions that are peculiar to individual farms present an infinite variety of circumstances. Nevertheless, the experiences of many single farms and of groups of farms with certain types of equipment have been recorded. These show a broad and impressive picture of economic advantage. But the proportion of the nation's farmers who share in many of these advantages still is relatively small.

A Water System First

Consider, for example, one of the first production items to be introduced on most farms after electrification—the electrically powered water system. The farm census of 1945 revealed that some 4,589,000 farm dwellings still lack running water in the home, let alone to barns and drinking troughs. Here, then, is a widely needed item that in many farm areas is already regarded as a complete necessity. It is clear that even a large proportion of the farms connected to power lines did not possess running water two years ago. And it is safe to say that the bulk of the unconnected farms that lack running water will seek that convenience only after they have obtained electric service.

Yet it can be easily demonstrated (as indeed it is every day) that the installation of a water system on the business side of the farm pays huge dividends on the capital invested. Labor is saved; livestock grow heavier; milk flows in larger supply, and is richer in butter-fat; chickens lay more eggs.

These returns add up to a huge sum, particularly if a value is attached to the time spent on the chore of carrying water. One farm with 15 cows, 500 chickens, and 50 hogs placed a yearly value of $1,710 on its water system. This was set against a total outlay for equipment (including installation) of $300, with $11.94 as the yearly cost for operation.

A more conservative but still impressive return is included in the report on a 25-cow farm in Vermont, which is set forth in detail elsewhere in this section. There the time conserved in pumping water for the farm alone (not including the house) was placed at one hour a day. And with labor valued at $.50 an hour, this saving added up to $182.50 a year. Thus, the return in one year more than paid for the pump ($125) and the cost of operating it ($7.20).

Few pieces of electrically powered equipment can come up with cash savings as great as those to be realized from a water system. Nevertheless, the pay-off on other equipment is great enough to war-

Scientific poultry raisers help the hens keep their heads by lighting up the laying houses so the hens will produce the egg a day that keeps the axe away

rant the respectful attention of any alert rural banker. And if similar opportunities were present in industry, management would jump at them.

The barn hay drier offers a case in point. This useful apparatus is not yet widely employed. Perhaps some 3,000 farms now possess it. Yet its advantages are so obvious that it is difficult to see how any progressive farmer who grows hay can go along without it. And about three-fifths of all farms produce some hay.

The hay drier is valuable because it conserves the crop from spoilage and vastly improves the quality of the hay. Barn-cured hay fed to 25 cows can eliminate an annual grain bill of as much as $500—enough to pay for the hay drier.

A cool dollar and cents appraisal of the return on the investment in many other types of equipment can be made. The electric milker, the cream separator, the barn cleaner, the arc welder, the feed grinder, are a few items on such a list. The saving in any particular instance depends in part on the number and character of other items that are in use. For the heavier the consumption of energy, the lower is the per kw.-hr. cost. And the more general the use of electrical current, the smaller is the unit expense for wiring and other minor costs of installing additional equipment.

These facts are apparent from an examination of the savings realized from a variety of uses of electricity as calculated from data of the Vermont Public Service Co. for a typical farm in that state (See table). This farm of 25 cows and 500 chickens employs electric-powered equipment which cost a total of $1,277. The savings realized from this equipment by reduction in labor alone are put at $749.62. Here is the way the annual income and cost statement for this equipment lines up on an over-all basis:

Yearly income (Saving from use of equipment)		$749.62
Yearly costs:		
For electricity (7038 kw.-hr.)	$139.30	
For depreciation (or amortization)	107.95	
For interest on capital investment (5 percent)	63.85	
Total Costs		$311.10
YEARLY NET INCOME		$438.52

This net income of $438.52 represents a return of 34 percent on the investment in equipment. If the cost of wiring (which varies greatly) is thrown in as a part of the original capital investment (say an additional $350), the return still tops 25 percent.

This is an over-all figure. It is not possible to show the full net

A 25-COW FARM, COSTS AND RETURNS

TYPE OF EQUIPMENT	Original Equipment Cost (1)	Interest on Investment @ 5% $	Depreciation Charge $	Kw.-Hr. Consumption (Annual)	Operating Cost for (2) Electricity	Total Cost	Value of Labor Saved (3)	Percent Realized on Investment	Basis for Determining Labor Saved
Lights	50.00	2.50	2.50	240	4.80	9.80	52.50	85	7 mo. ½ hr. per day
Milking Machine (2 kw.-hr. per cow per mo.)	250.00	12.50	25.00	600	12.00	49.50	182.50	53	12 mo. 1 hr. per day
Milk cooler (25 kw.-hr. per can per mo. 14 hr. aver. 6 cans per day)	330.00	16.50	33.00	1050	21.00	70.50	182.50	10	7 mo. 1 hr. per day
Dairy water heater (8 gal. twice a day)	65.00	3.25	6.50	1800	36.00	45.75	45.62	0(4)	12 mo. ¼ hr. per day
Barn ventilator	150.00	7.50	15.00	630	12.60	35.10	50.00	10	Est. saving in health of stock, dep. of bldg. moldy hay, veterinarian
Clippers	22.00	1.10	2.20	25	.50	3.80	.....	..	
⅓-hp. motor (for separator, concrete mixer, churn, emery wheel, grindstone, drill press, portable elevator, ice cream freezer, lathe, sprayer)	20.00	1.00	1.00	60	1.20	3.20	52.50	247	12 mo. ½ hr. per day
5–7½-hp. motor (for wood saw, bench saw, feed grinder, silo filling, hay hoist)	200.00	10.00	10.00	600	12.00	32.00	50.00	9	Est. saving in labor, time gas & oil, wear and tear on mach.
Soil cables: 2 sash hotbed (75 kw.-hr. per sash per 2 mo.)	15.00	.75	1.50	300	6.00	8.25	18.75	70	5 mo. ½ hr. per day
Water Pipe Protection (120 ft. cable & control, operating ¼ of time, 800 watts, 5 mo.)	15.00	.75	1.50	1000	20.00	22.25	.....	..	
Water Pump (pump only) 25 gal. per day for 25 cows, 2 horses, 12 young stock, 1,000 gal. per kw.-hr.	125.00	6.25	6.25	360	7.20	19.70	182.50	130	12 mo. 1 hr. per day
Brooder (2 broods, 300 chicks, ½ kw.-hr. per chick)	35.00	1.75	3.50	300	6.00	11.25	10.25	—3(5)	1 hr. per day
TOTAL	1277.00	63.85	107.95	6965	139.30	311.10	827.12	34	

(1) Based on prices in force in the autumn of 1946.
(2) Based on a charge of 2¢ per kw.-hr., which is the average paid per kw.-hr. for energy consumed by all equipment.
(3) Based on 50¢ per hour wage rates.
(4) Application of the off-peak rate of 1½¢ per kw.-hr. would result in a rate of return on investment of 14 percent. However, chief advantage of the dairy water heater is the more efficient and widespread use of hot water that it makes possible.
(5) The principal advantage of the brooder consists in a better developed chick plus the saving of labor and worry at a time when such savings are most important. These savings are hard to evaluate; therefore the rate of return is understated.

SOME USES OF ELECTRICITY ON THE FARM

Alarms (burglar & fire)
Arc welders
Bactericidal lamps—
  Dairy
  Poultry
Bag loaders
Barn cleaning
Barn and garage door opener
Barn ventilators
Barrel saw
Battery chargers
Blowers—
  Hay curing
  Grain
Bone grinders
Boring machines
Bottle fillers & cappers
Bottle washer
Branding irons
Brooders—
  Chick
  Lamb
  Pig
Bull exerciser
Butter cutting machine
Butter printing machine
Butter worker

Calf weaner
Casein grinder
Chicken picker
Cider press
Circulating air heater
Clippers—animal
Clover huller
Cold storage—
  Fruit
  Vegetable
Compressor
Concrete mixers
Conveyors
Cord wood saws

Corn cracker
Corn shellers
Crate stackers
Cream separators
Currying machines

Dairy water heaters
Drill—
  Portable
  Press

Egg candling
Egg cooler
Egg testing
Electric fence
Electric tools—all kinds
Elevators
Emery wheel
Ensilage cutters

Fanning mill
Feed grinder
Feed mixer
Flood lighting
Floor scraper
Flour & cereal mill
Forge blower

Gasoline pump
Glue pots
Graders, fruit & egg
Grain cleaning & grading
Grain drying
Grain grader
Green feed chopper
Grindstone
Grinding mills

Hack saws
Hammermills
Hay balers
Hay cutters

Hedge clippers
Hoists—
  Hay
  Grain
Honey extractor
Hullers—
  Pea
  Bean
Huskers & shredders

Incubators
Immersion heaters
Insect electrocutor
Insecticide sprayers
Insect traps
Irrigation pumps

Lathes
Lawn mower
Lighting—
  Barn
  Poultry
  Yard

Mash warmer
Milk cooling
Milking machines
Milk pasteurizer
Molasses heater
Motors—all kinds
Mowing machines

Oats crusher

Paint dryer
Paint mixer
Paint sprayer
Pasteurizer
Peach defuzzer
Picker (poultry)
Potato & onion cleaner & grader
Poultry debeaker

Poultry electrocutioner
Poultry water heater
Pump jack

Refrigeration
Rice thresher
Root cutter & shredder

Sanding machine
Saws (all kinds)
Seed cleaning
Seed dryers
Sheep shearer
Sheller for seed peanuts
Shredders
Signal systems
Silo filling
Silo unloaders
Soil heating
Soil pasteurizing
Soldering irons
Solder pots
Sterilizers
Stock trough water heaters
Sugar can press
Sweet potato shredder

Threshing machine
Time switches—automatic

Ultra-violet lamps

Vacuum cleaners—
  Animal
  Barn
Vegetable shredder
Ventilating fans

Water heaters
Water pail
Water systems
Wood splitters

return to be realized from an individual piece of equipment on the basis of labor saving alone. In the table costs are lined up against the values of labor saved for each piece of equipment. The rate of return on the various types of equipment varies greatly. In one case—the brooder—the return is negative on the sole basis of labor saving. Of course, the big return from this piece of equipment is achieved in another direction—from the development of a better chick. Likewise, the dairy water heater shows no net return if only labor saving is taken into account. But it too has other important values that arise from a freer use of hot water.

In all cases the rate of return depends in part on the cost of electricity for operation. The rural rate schedule of the Vermont Public Service Co. runs as follows:

First 14 kw.-hr.—$1.00
Next 40 kw.-hr.— .05 per kw.-hr.
Next 66 kw.-hr.— .03 per kw.-hr.
Consumption above 120 kw.-hr.— .02 per kw.-hr.
Special rate for off-peak water heating. — .015 kw.-hr.

Although a special rate for water heating is available, few farmers take advantage of it because of the nature of their hot water requirements. For those cases where it is possible to use the special rate, the return on the water heater investment in the table jumps from zero to 4 percent.

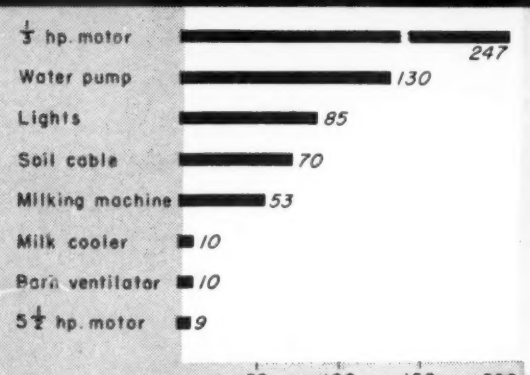
From the standpoint of his strict economic interest, therefore, the individual farmer may add certain equipment only on the basis of graduated rate schedules that make it worth his while to do so. Almost all suppliers of electricity now offer promotional rates in rural areas. But even under these favorable circumstances, the response of customers so far is extremely modest and varied.

Take the Public Service Co. of Northern Illinois, with a somewhat lower rate schedule than most. Despite the fact that the ordinary farm customer is served under a rate which has a 2¢ step for energy in excess of 100 kv. monthly, less than 1/10 of the rural customers have thus far reached 5,000 kw. per year use. And those that do fall within the higher consuming range display a marked variation in their choice and use of equipment.

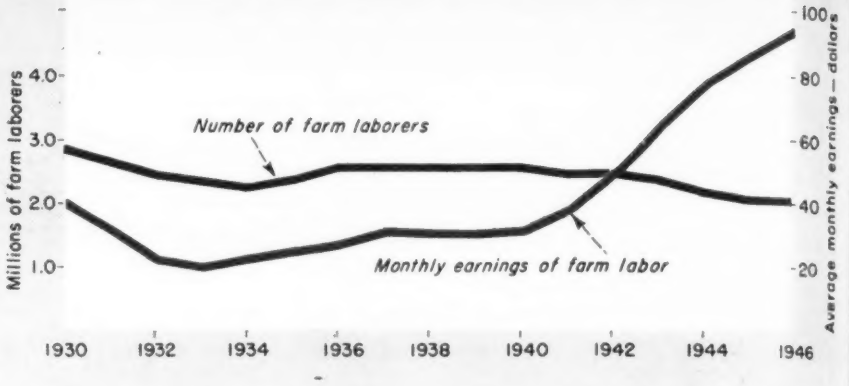
This fact emerges clearly from a consideration of another table which shows the equipment in use on ten farms served by the company. These have annual consumptions that range from 5,318 kw.-hr. to 20,448 kw.-hr. Altogether, some 34 pieces of electric-powered farm equipment and 27 home appliances are in use on one or another of these farms. Yet only home electric equipment—clocks, irons, radios, refrigerators, toasters, washers—and lighting are found in use by all of these high consumption customers. A close study of the table also indicates that some farmers are making more intensive use of the equipment that they possess than are some others.

The job facing those concerned with farm electrification, then, is not limited to adding new connections and building up the loads of small consumers. Even the largest consumers have a long way to go before they have exhausted the full economic advantages to be gained

Rate of return on various kinds of farm electric equipment



Farm labor costs are rising while labor force declines



EQUIPMENT OWNED BY 10 HIGH-USE CUSTOMERS

Farm Number	1	2	3	4	5	6	7	8	9	10
Annual Kw.-Hr	5,318	5,834	5,892	6,288	7,502	7,940	8,865	12,540	14,878	20,448
Residential Appliances										
Blanket			x							
Clock	x	x	x	x	x	x	x	x	x	x
Coffee Maker						x				
Cold Storage Unit		x					x		x	
Corn Popper				x						
Electric Casserole						x				
Exhaust Fan		x				x				
Food Mixer			x	x	x	x	x	x		
Furnace Blower	x									
Iron	x	x	x	x	x	x	x	x	x	x
Lighting	x	x	x	x	x	x	x	x	x	x
Mangle		x		x		x		x		
Portable Fan			x		x	x			x	
Pasteurizer			x							
Radio	x	x	x	x	x	x	x	x	x	x
Range		x	x	x	x	x	x	x		x
Refrigerator	x	x	x	x	x	x	x	x	x	x
Roaster		x		x		x	x			
Sewing Machine		x				x		x		
Shaver		x	x	x		x	x			
Stoker					x	x				
Toaster	x	x	x	x	x	x	x	x	x	x
Vacuum Cleaner	x	x	x	x	x	x	x			x
Waffle Iron		x	x	x		x			x	
Washer	x	x	x	x	x	x	x	x	x	x
Water Heater		x		x	x	x	x	x	x	x
Water System	x	x	x	x	x	x	x		x	x
Farm Equipment										
Air Compressor		x	x	x	x		x		x	x
Barn Ventilation						x		x		x
Brooders (Chicken)	x			x	x	x				
Brooders (Pig)						x		x		x
Clippers			x	x	x	x		x	x	x
Conveyor		x								
Cream Separator	x	x		x				x		
Dairy Water Heater			x	x	x	x		x	x	x
Drill		x		x	x	x				
Electric Fence		x	x	x			x		x	x
Elevator			x	x	x	x	x	x	x	
Farm Water System	x	x		x	x	x	x	x	x	x
Feed Mixer										x
Fly Killer					x	x		x		
Gasoline Pump		x								
Grindstone				x	x					
Hay Hoist			x							x
Hay Dryer			x				x	x		
Irrigation		x								
Lathe				x						
Lighting	x	x	x	x	x	x	x	x	x	x
Milk Cooler				x	x	x			x	
Milk Stirrer					x					
Milking Machine			x	x	x	x	x	x	x	x
Onion Topper		x								
Paint Sprayer		x	x	x	x	x				
Poultry Water Warmer	x									
Potato Cleaner		x								
Potato Grader		x								
Planer				x						
Saw	x	x		x		x			x	
Small Portable Motor		x	x	x	x	x	x		x	
Sterilamp										x
Tool Grinder	x	x	x	x	x	x			x	x

from existing equipment. And, of course, a stream of new items is expected to become available over the next few years.

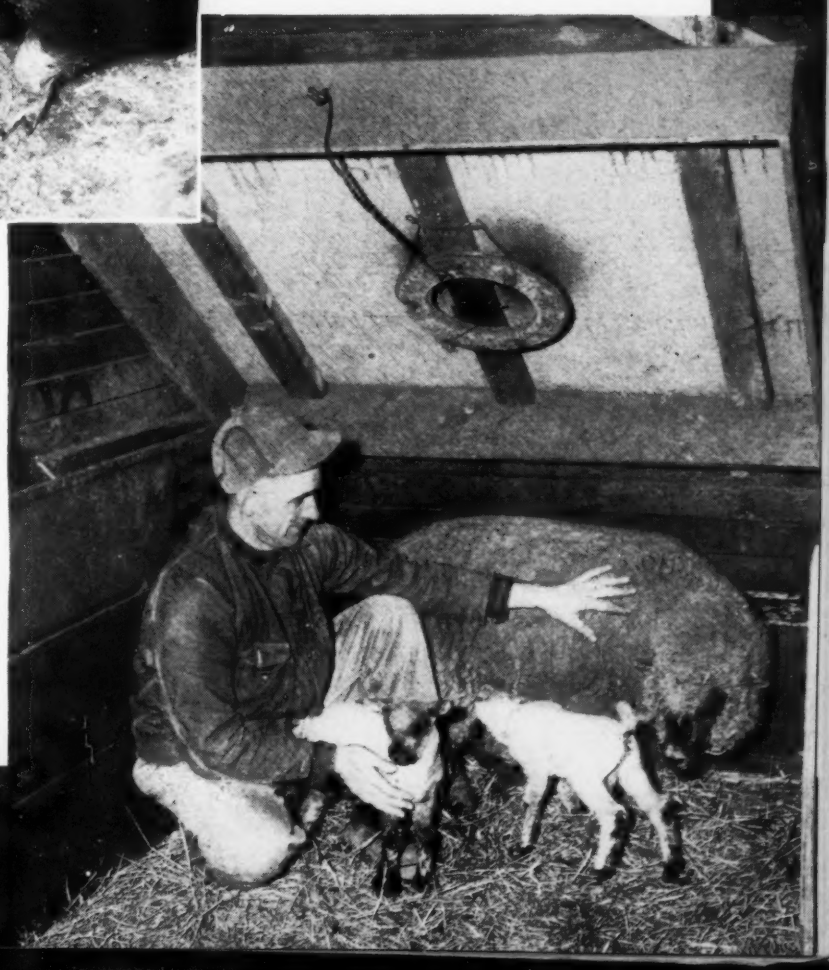
As a matter of fact, the saturation of even the most widely used electrically powered farm equipment is extremely low. Information on this subject is scarce and much of it is not of recent date. A few surveys have been undertaken, however, that give a general conception of the extent to which farmers own electrically powered farm equipment. One of these, conducted by *Successful Farming* in mid-1944, sampled 11,533 farms served by 47 REA systems, largely in the Midwest and South. The answers on farm equipment lined up as follows:

Type of Equipment	Percent of Farms Owning Equipment	Percent of Farms Planning to Buy Within Two Years After Availability
Food Freezing Storage Cabinet	0.2	1.4
Cream Separators	17.7	3.8
Feed Grinders	2.1	5.3
Electric Fences	14.9	5.8
Milk Coolers	2.7	2.2
Milking Machines	10.3	4.2
Motors—up to 1 hp.	24.4	5.4
Motors—1 hp. and over	4.8	5.5
Electric Water Pumps	36.9	17.8
Electric Water Heaters	5.5	11.7

These figures give no accurate clue to the extent of the future market. They merely suggest, as does the table which details the equipment of the ten heavy electricity consumers, that the task of farm electrification has barely been started even though 57 percent of the nation's farms have been connected to power lines.

Oats pour down from the bin above, through the fanning mill, and into a wagon below. And the farmer can relax a bit while electricity works for him

No chopping ice out of the stock drinking tank. Thirsty hogs and other livestock can drink their fill of electrically warmed water all winter long



The mortality rate of baby lambs, hogs and chicks is greatly lowered by the warmth and protection provided by electric brooders

SELLING FARM ELECTRIFICATION

Magazine published by a power company to promote farm electrification

It's easy enough to prove that farm electrification will pay off in dollars and cents. But the job of convincing the farmer that this is true for his particular case is something else again. For this is a problem of selling and selling is a problem of organization. In many respects organization for the job of selling farm electrification is only now beginning.

Four groups are hard at work to spread the use of electricity in the business of farming. One includes the suppliers of energy—the power companies and the REA cooperatives. Another is made up of manufacturers and sellers of electric-powered farm equipment. Still another includes federal and state government agencies. And the fourth is composed of educational institutions, chiefly landgrant colleges and farm organizations. Of these four, the first two are primarily concerned with electrification. The others are principally occupied with the larger field of improving all agricultural operations. In this process electrical applications are an important, but still only a single element. The programs and activities of the four groups are closely intermeshed. It is impracticable to deal here with the work of each in detail. Rather, let us concentrate on examining the activities of the first two groups—their methods, problems, plans, and their means of cooperating with the others.

The private utilities and REA have together taken the initiative in introducing electrification to a growing number of farms over the past decade. Theirs is the task of breaking the ground. It is the job of the electric equipment dealers, and the manufacturers working through the dealers, to follow up on the work of these evangelists.

The Public Service Co. of Northern Illinois furnishes a good exam-

National Farm Electrification Conference

In 1946 there was organized the National Farm Electrification Conference with the stated objective, "To bring together in conference individuals and groups interested in raising farm living standards and reducing costs by increasing the profitable use of electricity on farms." Participating in the Conference are professional engineering societies, trade associations, and farm organizations, as shown in the following list. The purpose in bringing the participating groups together is to acquaint each with what the others are doing in the promotion of farm electrification so that progress will be accelerated by the natural integration that results from knowledge of what is being done on the whole front.

The first meeting of the Conference, a sort of "trial balloon", was held in Chicago, in November under the chairmanship of George Kable, editor of the magazine *Electricity on the Farm*. Being the debut, so to speak, it was not expected that attendance would be large, probably not more than a couple of hundred. But if any proof ence, a sort of "trial balloon," was needed, it was supplied by the attendance of over 800, three or four times as many as had been anticipated. Discussions were lively and pertinent and it was enthusiastically agreed that the Conference should be made a continuing organization. Hassil Schenck, president of the Indiana Farm Bureau, was elected chairman for the ensuing year and later the steering committee met and selected Indianapolis as the place for the 1947 meeting to be held in October.

Participating Organizations

American Society of Mechanical Engineers
American Institute of Electrical Engineers
American Society of Agricultural Engineers
American Farm Bureau Federation
American Agricultural Editors Association
Edison Electric Institute
National Electrical Manufacturers Association
National Association of Farm Water Supply Manufacturers
American Washer & Ironer Association
National Electrical Contractors Association
National Electrical Retailers Association
National Electrical Wholesalers Association
National Wholesale Farm Equipment Distributors Association

ple of well-organized sales activity. Comparable activities are carried on by many others. This company sees its task in three aspects:

1. Education and publicity to acquaint farmers with electric service applications.
2. Research, study and development to make available to customers established and new uses of electricity in farm operations.
3. Sale of equipment and appliances for farm and farm home users, both directly and through encouragement of equipment dealers.

Pictures Tell the Story

Education of the farmer in the use of electricity is accomplished by this company in a variety of ways. One of the most prominent instruments is a rotogravure publication of application pictures taken on the farms it serves. This is mailed bi-monthly to all rural customers. Pictures are taken with first consideration to the persons concerned and second to the application. This technique recognizes the fact that people like to tell others of worthwhile things they are doing, and that the story told by the picture is more convincing when identified local people—often friends and neighbors—are included in it. Inquiries resulting from this publicity are followed up by agriculturally trained company personnel.

Still another educational medium used is the movie. A 30-minute color sound movie of the company's farm service activities, presenting local scenes and people, has been produced and is exhibited through the territory. Movie shorts of specific applications are planned; one already has been produced and shown. Sound-slide films are used to illustrate discussions of farm electric uses by company agricultural engineers.

Cooperative activities in rural youth programs—4-H Clubs and Future Farmers of America—are also important in the educational work of the company. In these activities the company seeks to be a dependable, willing helper; never does it try to run things. It sponsors meetings, assists in arranging and putting on training programs, helps prepare and distribute club publications and other literature, and acts as host at recognition banquets and other social affairs. One farm youth organization has established a camp for which the company supplies certain necessary facilities. This cooperation with young people has as its end the educating of the next generation of farmers in the uses and value of electrical power. This program of the utility recognizes the importance of social groups for this purpose and seeks to encourage them.

Since many people must see to believe, new equipment which is not in common use is demonstrated to them. Over past years many farms have been selected and equipped quite completely with electric devices so that they could properly be called electrified farms. At each of the farms a wide variety of equipment has been demonstrated to anyone who cared to come and look. In the future as in the past, the utility's working plan will be flexible—adaptable to everchanging conditions in its various service areas. It expects to cooperate with many farmers who are interested in one or a few specific machines or processes. These farmers must register an active interest in such equipment and an intention to buy if the equipment is satisfactory. The company believes that the customer should feel that the ideas involved in adapting the processes are his own and that it is his job to make them successful. In this way farmer salesmen are developed.

Exhibits at fairs and other public events, and field tours for interested groups are a definite part of the company's program.

These various forms of cooperation with customers bring in their wake many questions which require further investigation. This leads to research, study and development. This phase of the sales program involves work in the laboratory, on farms, at universities, and with equipment manufacturers. The work is carried on by agriculturally trained personnel with the aid of other technically trained people

Former G.I.'s, now young farmers, learn about barn hay curing

both within the company and outside. Existing farm equipment is studied to determine operating characteristics when electric power is applied to it. This is a big field, for much remains to be done in the way of changing working habits so as to reduce labor, as well as to develop devices for automatic operation of machines usually requiring attendance.

Some of the testing and developing problems can best be handled in a laboratory of the type used for many other company studies. Here equipment can be altered and even new machines built. But often the work requires a farm with facilities which are difficult to duplicate at a laboratory. Arrangements are made for the use of farms of the several types represented in the territory—dairy, poultry, livestock, and grain—for research of this character.

There are still other problems that require the facilities of a large university where research on many associated phases can be carried out in close relation to the actual operation. Here are studied projects, like experimentation in livestock feeding, that may not involve electrical equipment in the early stages of development but which probably will do so later. The company works directly with the universities of its area on such research, sometimes furnishing manpower and technical know-how, and at other times furnishing financial assistance.

Most manufacturers possess both equipment and personnel to do a good job of production but they do not always have people who are familiar with the "down on the farm" viewpoint. The appearance on the market of improperly designed machines is evidence of this fact. The experience of the company's agricultural engineers on practical farm problems is valuable in guiding such manufacturers, both in improving existing equipment and suggesting new types.

Purely an Adviser

Based on the status of rural electrification in its area, the company feels that a ratio of one agricultural engineer to each 2,000 customers is justified. His assignment includes responsibility for much of the company's research and development activities described above. Moreover, in addition to studying and solving problems directly on individual farms, he cooperates with dealers throughout the territory and with company rural salesmen. The work of the agricultural engineer is quite broad in that it covers all phases of rural electrification except actual selling of equipment. It includes contacts with farm organizations, advice on wiring, designation of line extensions, and surveys and records. This places him in a purely advisory capacity to the customer on any matter involving electrification.

The company also employs agricultural home economists to carry on the same type of work inside the home as the agricultural engineer does on the farm equipment outside. The home economist is responsible for contacts with the various rural women's organizations. Locating suitable pictures for the company's farm publication, showing movies, sound-slide films, and conducting meetings of farm women are all part of her regular duties.

Actual sale of equipment is in the hands of rural salesmen who follow up the work of the agricultural engineers and economists. When equipment becomes generally available, the utility expects to maintain a ratio here of one salesman to each 1,000 customers. Every customer will receive a periodical call from his salesman. The company offers for sale a wide range of electrical merchandise, including practically all household appliances and a very limited variety of electrically powered farm equipment. Electrically powered farm equipment, in most instances, is not stocked by the

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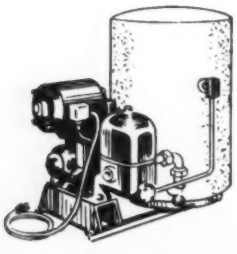
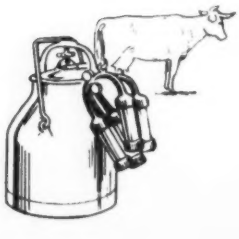
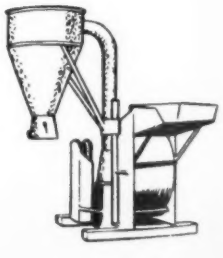
Typical items of farm electric equipment and estimated annual markets for them during a five-year period. Market estimates assume that the specified five-year period will begin when manufacturing is no longer hampered by shortages and an adequate distribution set-up has been organized ▼

ESTIMATED ANNUAL SALES OF FARM ELECTRIC E

WATER SYSTEMS	MILKING MACHINES	CREAM SEPARATORS	MILK COOLERS	FEED GRINDERS
				
300,000	125,000	75,000	30,000	60,000

company. When such equipment is required—brooders, feed grinders, motors, hay dryers, hoists—the local dealer takes over the sale of the item.

The foregoing description of promotional and sales activities of the Public Service Co. of Northern Illinois gives some idea of what a great number of power companies are doing to give farm electrification a good boost. REA, as the government agency chiefly concerned with this matter, is contributing a similar effort. The big job of REA, of course, is that of bringing power to farms. However, it also is active in developing a wider use of electricity by its cooperatives. To this end, REA vigorously conducts a continuing educational campaign on the application of electricity to farm operations. It maintains a corps of agricultural engineers schooled in the use of electricity in farming. These engineers are available to cooperatives for advice and assistance. Finally, REA provides financial aid to members of cooperatives who require it in order to buy electric powered equipment that will pay for itself over a period of time.

The whole gamut of agricultural development — soil conservation, dairy herd improvement, meat animal production, market research, farm product grading and preparation, crop experimentation, encouragement of local processing, anything and everything to boost its farm customers to a higher level of prosperity—is included in the picture of farm service activity as undertaken by the utilities and government agencies concerned with rural electrification. The bookkeeping consideration is, of course, that more electricity can be sold to more prosperous farmers. There is also a further reward, the feeling that a worthwhile contribution to the social progress of the nation is being made.

Dealers Do the Selling

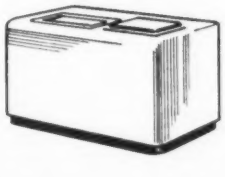
Although many utilities and some REA cooperatives follow up their educational and promotional work with actual selling of electric powered farm equipment, this latter job is largely in the hands of independent dealers. The impetus for selling such equipment, of course, comes in no small part from the manufacturers. And any consideration of the sales distribution organization for farm equipment must review the efforts of manufacturers to set up adequate marketing systems for their products.

Equipment generally flows from the factory to the farmer through a wholesaler - retailer channel. Whether the manufacturer is large or small, he leaves to the wholesaler the task of organizing retail outlets. Wholesalers of electric powered farm equipment today are faced with a complex problem. They must undertake an enormous expansion of retail outlets. They must obtain better qualified dealers than they have often had in the past. The traditional farm equipment dealer often lacks the special knowledge and interest that are necessary to promote and sell much of the new electrical equipment. In not a few cases he already carries items that compete with those powered by electricity. Seldom is he prepared to take to the field to do an active selling job. Rather, he usually depends on the national advertising of manufacturers to acquaint the farmer with a specific product and then waits for the customer to come and buy.

To perform his part in the program of farm electrification effectively, a dealer must do much more than sit in his store and wait for customers. First, he must know intimately the things he sells, including their uses on the farm. Second, he must realize that his goods require selling in the field and will not be bought in the store. Third, he must provide adequate service and repair facilities. And finally, either he must be a wiring contractor himself or be competent to see that his customers have adequate wiring installed. There are a few such retailers of farm electric equipment scattered over the nation; there should be thousands more.

It is of particular importance that wiring be one of the specific

RIC EQUIPMENT OVER FIVE-YEAR PERIOD

CHICKEN BROODERS	IRRIGATION SYSTEMS	HOME FREEZERS	REFRIGERATION STORAGE UNITS	HAY CURING INSTALLATIONS
				
125,000	20,000	135,000	25,000	13,000

concerns of the seller of farm electric equipment. Urban electrical contractors are not generally interested in farm wiring because at present they have plenty of work closer to home. Moreover, the farmer himself, unless he is instructed in the necessity for adequate wiring, is quite likely to buy a skimpy job to save money. Promoters of farm electrification recognize the seriousness of this problem. They put special emphasis on adequate wiring and have prepared and circulated detailed instructions regarding it.

A good description of the operations of a farm electric retailer who fills this bill was printed in the March, 1947, issue of *Electrical Merchandising*. The retailer is the Modern Equipment Co., Great Falls, Mont. All farm electric items are sold, principally by the efforts of field salesmen who call regularly on farmers for miles around (and "miles around" covers a lot of territory in Montana.) The firm does wiring, plumbing, tile and cabinet work; the farmer can buy a complete job on one contract. A competent service department is included. The firm did a gross business of $100,000 in 1946.

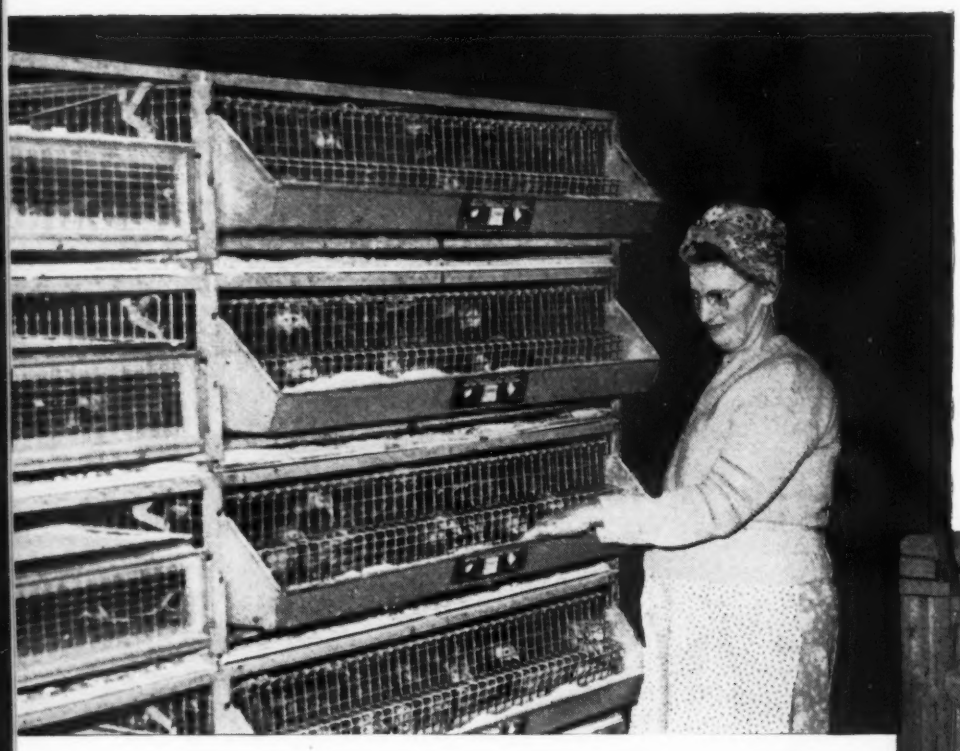
Because retailers of this type are so few, most of the real selling of equipment is now done by the suppliers of electricity, a large part of it directly and the rest by referring prospective buyers to dealers. Under this arrangement electric equipment is moving into the hands of farmers much too slowly. It must move faster if farm electrification is to go ahead as rapidly as the needs of the nation require and as is warranted by the present favorable economic situation of the farm population.

Electrical manufacturers and suppliers of service, individually and together, are working hard to improve their wholesaler-dealer outlets. All are aiming at the objective of the program, "More Power to the American Farmer," recently announced by the General Electric Co. This looks to the development of a new type of retailer, the "Farm and Home Dealer," located in the farm trading center, someone already in business selling electrical goods, farm equipment, lumber, feed, hardware, or other merchandise, or a newcomer, perhaps a veteran.

The manufacturer plans to help the wholesaler and the dealer in a variety of ways. Educational campaigns are being stepped up, both through national advertising and through the preparation of special educational booklets and films.

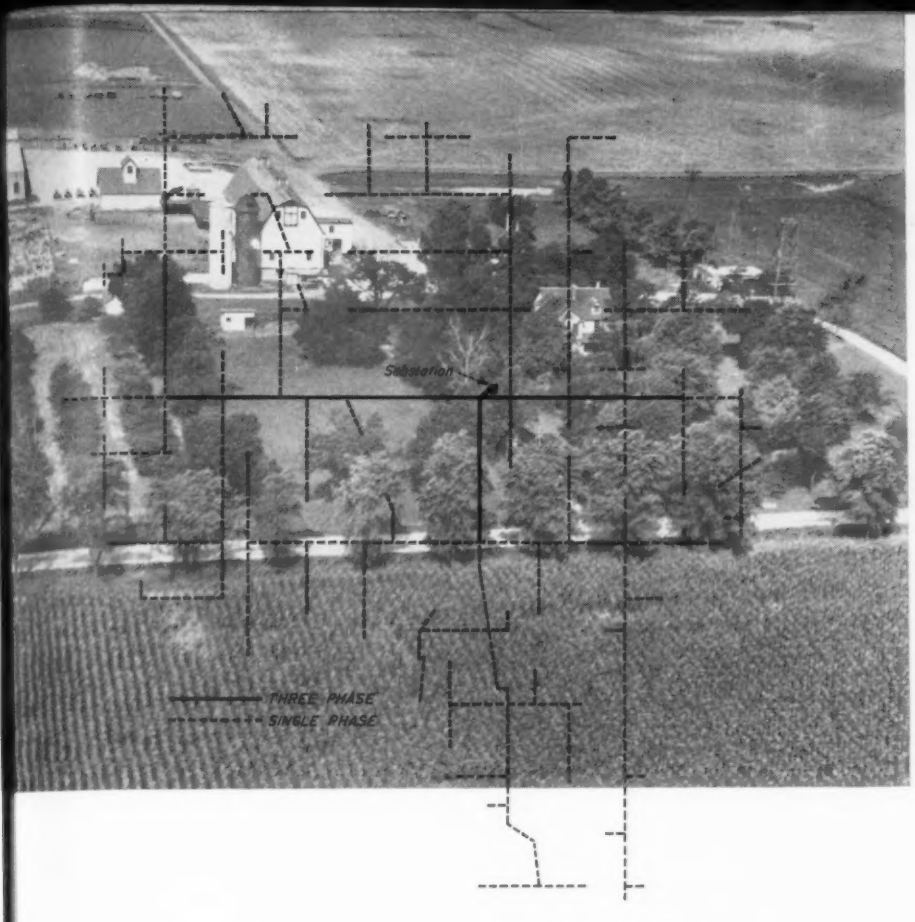
Manufacturers and wholesalers both are expanding their financial assistance to dealers and farmers. At present, government regulations on consumer credit limit such assistance to some extent. But as these regulations are further relaxed, credit terms will become easier. Moreover, rural banks are expected to adopt a more liberal credit policy on farm equipment than they followed in pre-war days.

From the above survey, it is clear that farm electrification, in the sense of intensive and widespread application of electricity to agricultural production, still has a long way to go. It must be sold to farmers just as industrial electrification had to be sold to factory and mill operators. This selling job has hardly been started. Millions of farmers must be taught what electricity can do for them; adequate channels for distributing farm electric equipment must be set up.



Electrically heated battery brooders make it easy to care for chicks 3 to 4 weeks old

Motor-driven portable saw built by the farmer's son with native hard maple cut on the farm



Single-phase distribution serves 75 percent or more of the road mileage in typical rural areas. Three-phase main lines from substations supply single-phase loads and single-phase branches

ELECTRICITY SUPPLY FOR FARM SERVICE

Like a blanket over the nation is the spreading web of power lines bringing electric service to American farmers. But the blanket is pretty thin in many places. It was woven fast in order to get coverage. The time is now approaching when added capacity must be provided.

To accelerate the extension of electric service to the farms of the country, already under way by work of the power companies, was the purpose of the law creating the Rural Electrification Administration a decade ago. Now that purpose has been largely achieved and the practical attainment of the ultimate goal is in sight. Within a short time—two, three years or so—every farm in the nation, except those so isolated as to be outside of practicable reach, will be connected to a power line or can easily be connected if the farmer wishes.

In the years before REA came into existence, the power companies had built many thousand of miles of rural lines, making service available to over 1,000,000 farms of which nearly 800,000 were connected. This had been done pretty much on the basis that farm service should pay a return on at least the incremental investment it required.

Then the country became conscious that farm service must be provided as a basic economic and social requirement. REA was started and the power companies accepted the enlarged responsibility.

From the first, REA took the position that the costs of building farm lines, as done by the power companies, were much too high. There ensued an intensive effort to reduce line costs. Resulting therefrom is a great deal of rural line construction standing today which is quite inadequate for the present service required of it. The condition is intimated in the 1946 report of REA, "In many sections the increased use of power and the many new connections were outstripping existing facilities . . . ".

The situation was described by Claude R. Wickard, REA administrator, in more specific terms in a speech at Springfield, Ill., in September, 1946. According to Mr. Wickard, more than half (432 out of 835) of the then existing cooperative systems "even now are not able to supply all the power needed by their present consumers."*

Electricity distribution in rural

* It is interesting to note the statement of Mr. Wickard in connection with a prophecy contained in a survey, "Farm Line Building Practices," published in ELECTRICAL WORLD, August 15, 1936:

"From frequent observation of engineers quibbling over a few cents in the price of a dead-end clamp, trying to figure out a way to save a couple of feet of wire in a transformer connection or weighing the cost difference between a pole top and a drive pin, one man of very large experience in line construction finally burst forth with the opinion that in a few years some men he knows are going to regret the way they are building lines today. He refused to be more specific, and when he saw the interest his words aroused appeared rather to wish he had controlled his feelings better. Possibly he should not have sounded off the way he did, but one cannot avoid the thought that history will write down a certain amount of the present effort toward low-cost rural lines as having been, at least, misdirected."

areas for the most part has developed as a succession of relatively small line extensions to serve groups of customers. Broad planning has been limited. In fact, it has been impossible in most cases. The only development that can be called planning is the idea of "area coverage," adopted by REA, as well as by many of the power companies. By this is meant building lines so that every farm in the area has service immediately available. But area coverage is not planning in the sense of knowing present and future loads and service requirements and incorporating that knowledge into system design. However, with area coverage completed, in a given instance, it becomes possible to develop the pattern for an ultimate system capable of handling heavier loads. Alterations for necessary additions to capacity can be made in accordance with the pattern as set. Such a plan will result in appreciable savings as against random and only expedient measures to care for local situations as they are caused by the accessions of new loads.

Mostly Single-Phase Service

Single-phase lines have been used most generally for rural service extensions, with only an occasional three-phase service, usually for a commercial or industrial load. As is indicated on the accompanying layout of a typical rural distribution system, there is an average of 75 percent or more of single-phase construction in rural line mileage. Three-phase lines extending from the substation to load centers supply the single-phase branch lines and extensions, and also single-phase services along the feeder routes.

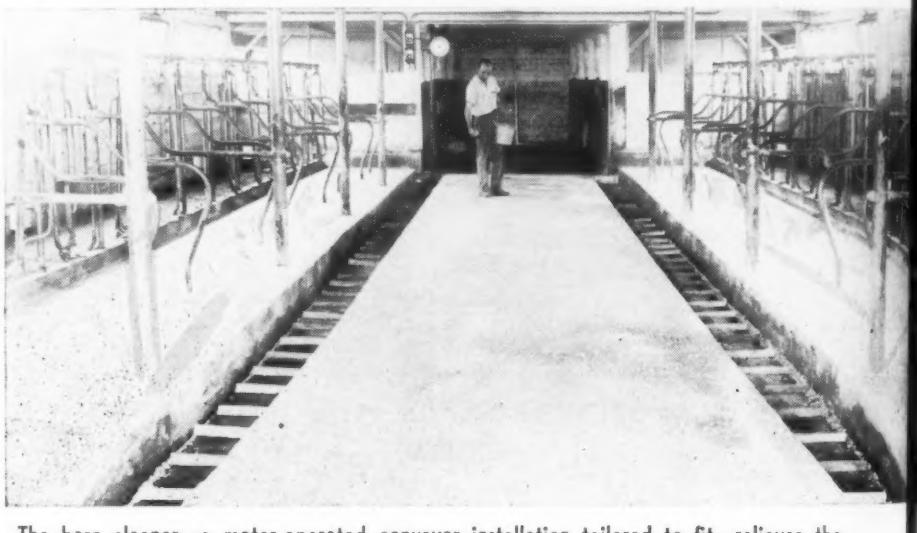
Such a system as that shown can be, and a great many have been, constructed at very low cost. But the low cost was accomplished by skimping on factors of design on which adequacy and quality of service depend, as is intimated in the earlier-quoted paragraph from an ELECTRICAL WORLD survey. Long spans with wires of high tensile strength and reduced electrical conductivity, transformers of small capacity, insufficient provision of fuses and other sectionalizing devices, minimum or no protection against lightning, all these have put serious limitations on load growth. These limitations are now becoming apparent as new applications of electricity to agricultural production are introduced and established applications receive wider acceptance by farmers.

Despite these widespread and admittedly serious shortcomings, it should not be assumed that all existing rural electric distribution systems are incapable of meeting present and future demands. On the contrary, many of both power company and REA systems are well engineered, well constructed, and are entirely adequate for present loads. And they can easily and economically be revised to handle future demands.

The typical system illustrated might have been designed and built, as a great many were, in an appreciation of the potentialities of farm load development. Such a system could then be expanded to handle doubled or tripled demands and energy sales per customer, with additional expenditures relatively small in comparison with the original investment.

Continuity of supply and voltage regulation on a par with urban service have not generally been considered essential or even possible as lines have been extended farther into rural areas. Exposure to natural hazards, such as lightning and wind, causing failures of service, has increased almost in direct proportion to miles of line. Transmission outages have been more frequent than in urban service because dependence in farm service is usually on thinner and fewer channels of supply.

As farm loads grow and require additional capacity in the systems serving them, more substations will be built and feeders will be shortened. The user will then be brought closer to the center of supply. Thus exposure to natural hazards will be decreased and continuity of service improved. Provisions for bulk supply will be bettered. But more than this is needed if electricity is to perform the range of farm jobs that have been envisaged for it.



The barn cleaner—a motor-operated conveyor installation tailored to fit—relieves the farmer of much back-breaking work and improves barn sanitation. And better sanitation means a lower bacteria count in the milk

In days past farm service was considered, and is still considered by many farmers and more than a few power suppliers, to be merely provision of electricity for lighting and perhaps for a few small appliances and a radio. It did not matter then, except as an inconvenience, if the juice went off, maybe quite frequently and for considerable length of time. But the picture is different if the farmer has a thousand or more eggs in an incubator or needs a large continuous supply of water for dairy operations. Then a failure of service may well mean a substantial financial loss. As electricity takes on more and more work in farm operations, dependence on it becomes as vital to the farmer as to the industrial concern which suf-

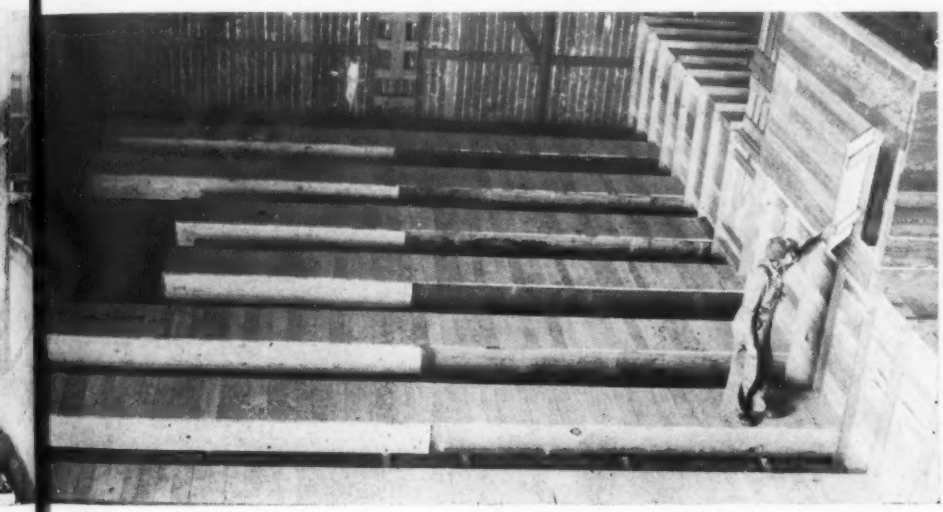
fers loss of production if the service is interrupted.

Reliability of rural service has been increased in recent years by new inventions and improvements in sectionalizing devices. Automatic reclosing circuit breakers and multiple-shot fuses, coordinated in operation for maximum protection to service, are cases in point. Points of trouble are quickly isolated and their effects are confined to small areas and reduced in duration by these devices.

Voltage levels must of course be maintained within reasonable limits for satisfactory operation of farm electric equipment. But it does not seem probable that fluctuations in these levels will be as critical a problem as often they are in urban service. Farm devices that cause the more serious voltage dips are used mostly in the daylight hours when there is little or no lighting in use to show their effects. Another factor is that most farm connections are through individual transformers and thus there is less effect on and from neighboring loads. Also when a farmer knows that it is the starting of his own motor that is causing his lights to flicker, he is less likely to be bothered by it than if the source of the annoyance is unknown.

However, there are coming into wider use certain farm electric applications whose effects on voltage levels cannot be so easily brushed aside. Welders and large motors, for example, can create voltage disturbances that extend over wide areas of primary supply. Makers of these devices have done much to hold their instantaneous demands to minimum values. But there is a limit to what can be accomplished in this direction. The only practical way to deal with the problem is through control by the electricity supplier of the size and kind of equipment allowed to be connected to the line.

For normal voltage control, regulating devices especially designed for rural lines have been developed. The combination of load growth and of lower cost regulators will more frequently justify closer voltage control in terms of economy. An increasing use of voltage regulators on rural feeder lines seems to be indicated as the alternative to increasing sizes of primary conductors to handle growing loads as farms and farm operations are more fully electrified.



This farmer has one of the new things—a hay curing installation—that will conserve the nutrient values of his crop and make him independent of the weather. Also he will reduce fire hazard from spontaneous combustion of damp hay

Conversion of farm lines from single- to three-phase service is an obvious recourse as loads become larger and have more troublesome affects on the system. To do this requires substantial increase in investment. Various estimates indicate that a change to three-phase will add 30 to 50 percent to the cost of the original single-phase line. Cost of the individual service, including transformers and protective equipment, will be 75 to 100 percent more for three-phase than for single-phase. Also there will be a higher cost for farm wiring.

These heavier costs for three-phase service have led farm line operators to look for other ways to provide what the farmer wants in larger power applications. It is the conclusion of many engineers who have carefully studied farm electric applications that a 7½-hp. motor is adequate for any usual farm machine. In some cases two small motors can replace a larger one at little or no increase in cost. This is particularly true if the larger motor is three-phase, requiring additional wiring.

On many rural distribution systems, motors as large as 7½ hp. cannot be served without introducing problems of voltage disturbance. The maximum size permitted by service rules on most systems at the present time is 5 hp. But it is probable that with wider use of regulatory equipment and as systems are otherwise improved to handle growing loads, allowable motor size on single-phase can be raised to 7½ hp. without causing serious voltage trouble.

Much to Be Done

Summing up, it may be said that in the simple consideration of connection of farms to power lines the job of rural electrification is approaching completion. But as regards provision of electric service in adequacy and quality for thoroughgoing electrification of farm operations, a tremendous amount of work remains to be done. A significant number of existing rural distribution systems will practically have to be rebuilt and many more will need strengthening and improvement.

The pattern of rural electric distribution design is still evolving, is far from being fixed and set. Its factors and values are still indefinite, defying conclusive engineering determination. In the process of evolution there are opportunities for invention and for the exercise of ingenuity in development of equipment and of construction and operation practices. One thing is certain. Rural service distribution systems will be a growing market for electrical equipment and materials for many years to come.

SUMMING UP

THE farmer now is in a better position than ever before to take electricity into his business. He can afford the investment. His rising costs offer a powerful incentive for speedy action. But many stubborn problems must be overcome if U. S. farming is to have full access to the production benefits of electricity.

Existing farm electrical equipment needs to be improved and new equipment must be developed and brought into production.

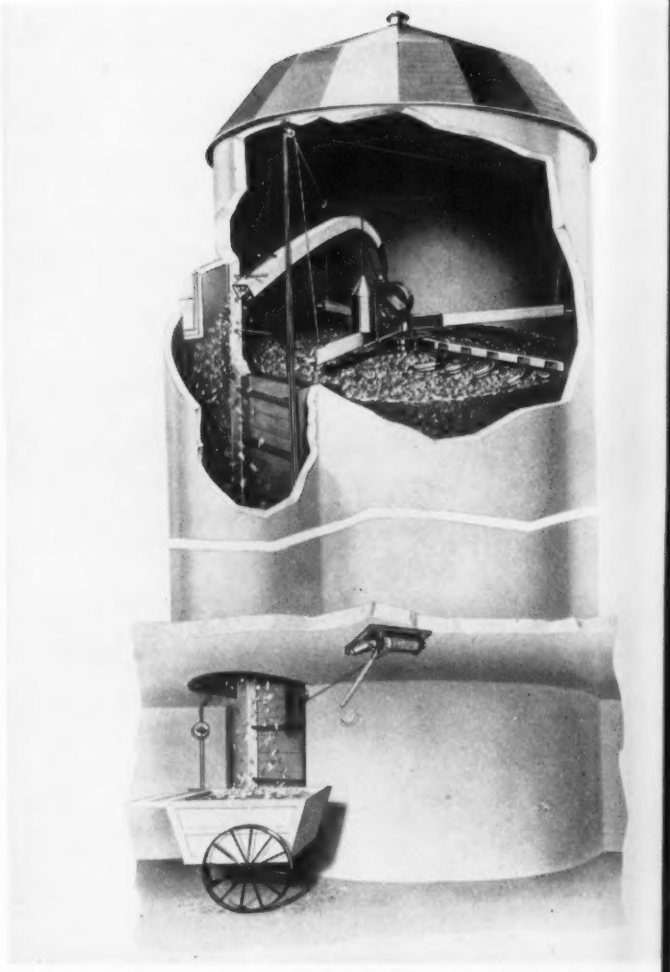
The farmer must be educated to the use and value of electric farm equipment. To this end, a more numerous organization of vigorous and knowledgeable dealers is essential.

Systems of electricity supply in many rural areas need to be revamped to carry heavier loads. New systems must be conceived with an eye toward the full potentialities of farm electrification.

These are not simple problems. Each of these general objectives wraps up a multitude of detailed tasks that require the best energy and intelligence of men working together in many organizations.

The job of electrifying U. S. farming will, of course, never be fully completed. The next five to ten years offer the most challenging and engrossing period in the process. For within the cycle of growth, progress during the next decade should be at a maximum.

The pictures that illustrate this section, with one exception, were supplied by the Public Service Co. of Northern Illinois. For these, for much of the information contained in the articles, and for helpful comment and suggestion in their preparation, ELECTRICAL WORLD expresses thanks.



Electricity takes over a major chore with the automatic silo unloader

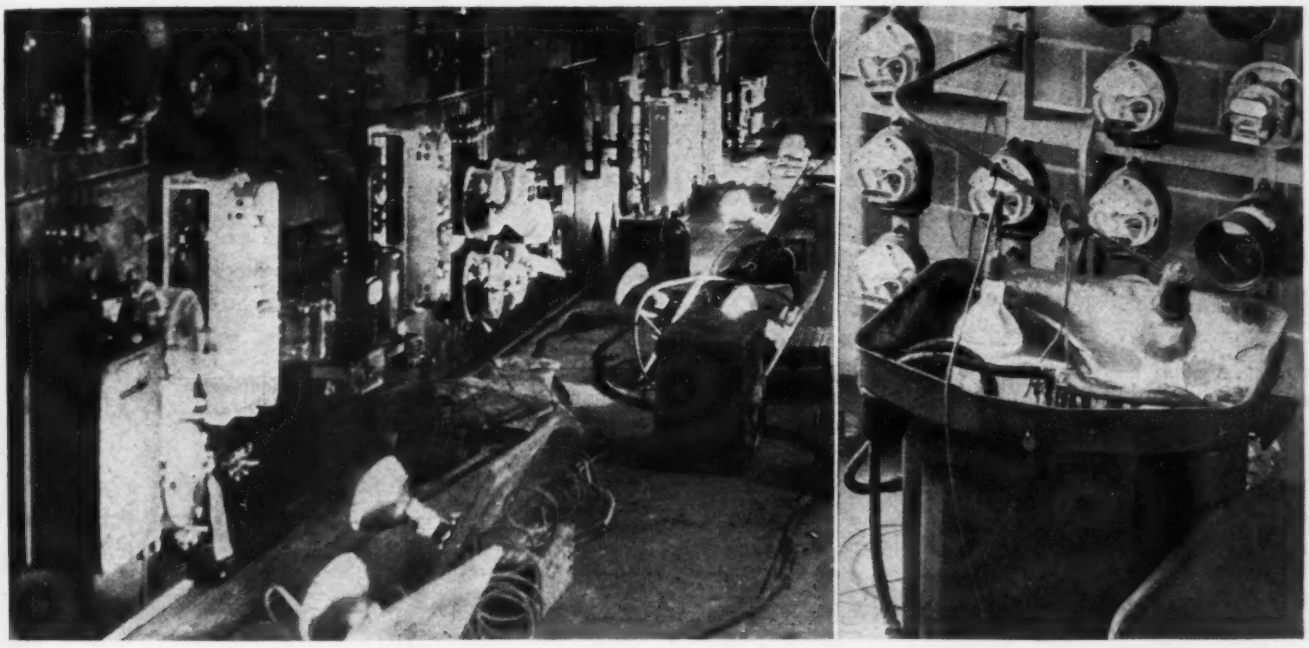
Adequate barn lighting speeds up work. These are dust-tight reflector units installed in a hay mow

Time is saved and quality is improved by immediate precooling of milk warm from the cow, before it goes into the holder cooler

HOW

DESIGN • CONSTRUCT • OPERATE • MAINTAIN

Dry Flooded Equipment With Infrared Lamps



INFRARED LAMPS used in pairs to dry switchboard meters . . . Distribution transformer being dried by two 250-watt heat lamps

C. W. PINKEL
Lighting Engineer
Illinois Power Co.
Belleville, Ill.

BY THE USE of infrared lamps in our plant and meter shop after the flood of August 16, 1946, a number of meters and other equipment were dried and returned to operation in a reasonably short time.

The switchboard was in about 5 ft. of water when the flood was at its height. After the flood waters receded it was necessary to turn a water hose on the board to remove the muck and dirt that had accumulated. The meters and instruments were treated in the same manner to remove the muck.

Next step was to dry the meters quickly to prevent rusting. A number of R-40 250-watt infrared lamps were mounted on asbestos boards, used in pairs, and were turned on for several days. Another lot of drying lamps were used on the back of the switchboard to dry the wiring and terminal blocks in the shortest possible time. The method was found to be very satisfactory.

Other heat lamp drying operations were:

Two lamps were applied to electronic equipment used in testing meter standards; two more lamps were set up to an old style distribution transformer that had been submerged in the flood waters; one heat lamp was used on a high voltage testing transformer for seven days after which the transformer operated satisfactorily.

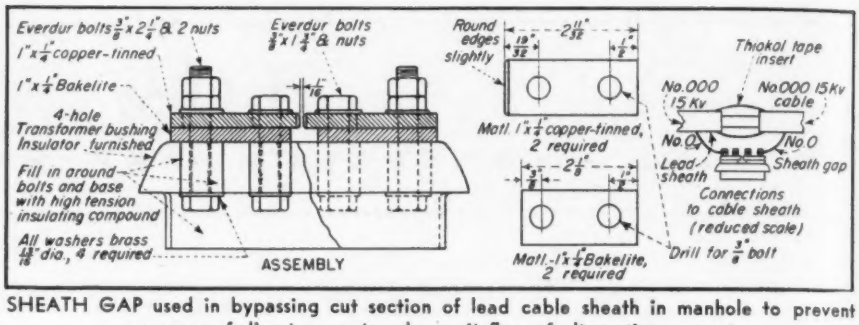
In the vicinity several industries used heat lamps to dry out 3-phase motors which were cleaned of mud but were not removed from their bases. The lamps were placed around the motors so as to apply the maximum amount of heat. After 24 hr. some motors operated satisfactorily.

• • •

Sheath Gap Stops Cable Electrolysis

TO FACILITATE sectionalizing lead cable sheaths against the flow of direct current in areas subject to electrolysis, the Boston Edison Co. developed an easily handled sheath gap, as shown. In its application the cable sheath is cut in two places and removed for a short distance (generally a few inches) in the manhole. Thiokol tape insulation is wrapped around the cut section, to protect it against moisture, and the sheath gap is then connected to the adjacent sheaths by No. 0 jumpers terminating at bolts which clamp tinned copper bars to bakelite bases fastened to a 4-hole triangular

bushing of the type used in connection with certain distribution transformers. The copper bars, 1 in. x $\frac{1}{4}$ in., are separated in the middle of the device by a gap $\frac{1}{16}$ in. wide, which prevents passage of direct current but allows any alternating fault current to flow by jumping across the gap. High-tension insulating compound is used to fill in around the bolts as shown in the assembly sketch.



SHEATH GAP used in bypassing cut section of lead cable sheath in manhole to prevent passage of direct current and permit flow of alternating current

• • •

An ELECTRICAL WORLD *Comparison of Practice*

Transformer Load Estimates Give Diverse Results . . . I*

A GROWING INTEREST in distribution transformer load estimating before the war has been increased because load check schedules have not been maintained and there is now a lack of the data needed for new layouts. Reliable tests are not always possible at the time a decision must be made for rearrangements of transformer and secondary supply sections. Load growth expected in the next few years increases the need for a reliable means of rapidly reviewing loads on a system-wide scale.

Any load estimating method is empirical at its base. Test data and other information must be coordinated to arrive at unit values because there is no mathematical approach to the factors of demand, diversity and time. Values used by others can therefore be especially useful as a starting point, and a comparative review of curves and charts developed in a dozen companies may help in this direction.

Need Local Solutions

A chart or table of values developed for one set of conditions, however, may not be directly applicable under other conditions. A simple example of 40 residential customers was assumed for the purpose of comparing the twelve methods of estimating. Solutions varied, as shown in the accompanying tabulation, from 12 kva. to 35 kva. It is quite possible that all of these answers are correct when interpreted for the local conditions and the rest of the procedure, but they emphasize the need of care in adopting any chart or method.

Eight of these methods have been summarized in charts or nomographs published in ELECTRICAL WORLD, some with details of their bases and others only in final form, and the other four are in regular use or have been suggested by operating departments. Each method reflects variations on four principal points which must be known for dependable use.

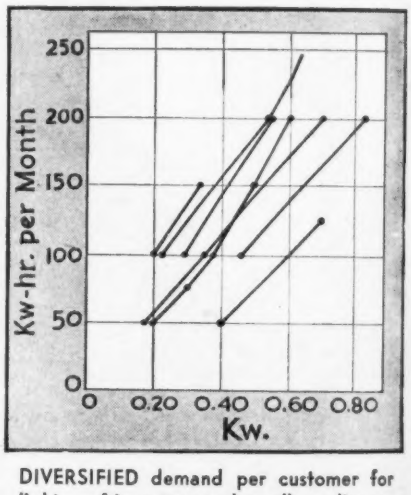
1. Results on the chart may show either the maximum integrated demand to be expected or they may give the transformer size required. In the latter case the chart must then include allowance for growth and for loading and rearrangement practices.

2. The size selection may be on a basis of 130 percent or up to 160 percent, which is the general band of practices for permissible loading over the rating before change to the next size.

Answers vary from 12 to 35 kva. with 12 methods of estimating this example

Example: 40 customers—10 with ranges and using 250 kw.-hr. per month; 30 without ranges and using 100 kw.-hr. per month. Estimates with method:

1	12 kva.	7	25 kva.
2	16 kva.	8	25 kva.
3	19 kva.	9	25 kva.
4	21 kva.	10	28 kva.
5	21 kva.	11	28 kva.
6	23 kva.	12	35 kva.



DIVERSIFIED demand per customer for lights, refrigerators and small appliances varies directly with kw.-hr. use (maximum month), but spread of various estimate values is wide

3. The allowance for load growth may vary from one or two years, if the estimate is on a present installation and the question is a change to a larger rating, to several years, for a new installation.

4. The possibility of coincidence of range and lighting demands is a major factor. Rural services and communities in rural areas may have range peaks at noon or before, with very little overlap of range and evening lighting load. Suburban areas of metropolitan systems, on the other hand, more often show evening peaks with ranges in use and the demands may represent coincident maximums of ranges and lighting diversified demands.

A general conclusion that has followed from many tests and is the

* Beginning a series of three articles.

basis of most reliable estimating is that an increase in energy consumption for lights, refrigerators and small appliances means a proportionate increase in demand. An increase in kw.-hr. means either an increase in watts at time of peak or an increase in hours, which reduces the diversity.

The accompanying curves have been derived from the charts and values used for estimating and they show that there is not an agreement on the exact values even though there is on the basis of increase. For comparison, the demands are related to maximum month kw.-hr., although some of the methods use annual consumption, average of several months, or some approximation to indicate energy consumption. Actual unit values used may not vary as much as indicated on this chart, since the final estimating is subject to other interpretation in conjunction with the final estimating.

Simplification of the estimating procedure is possible with an average value for demand per customer, without reference to monthly or annual consumption. Five such figures from the estimating charts are: 150, 300, 310, 325 and 400 watts per residence. Classification of houses has also been used by one company, with 250 watts for a four-room house or small apartment and other values up to 750 watts for large houses.

Diversity and Range Data

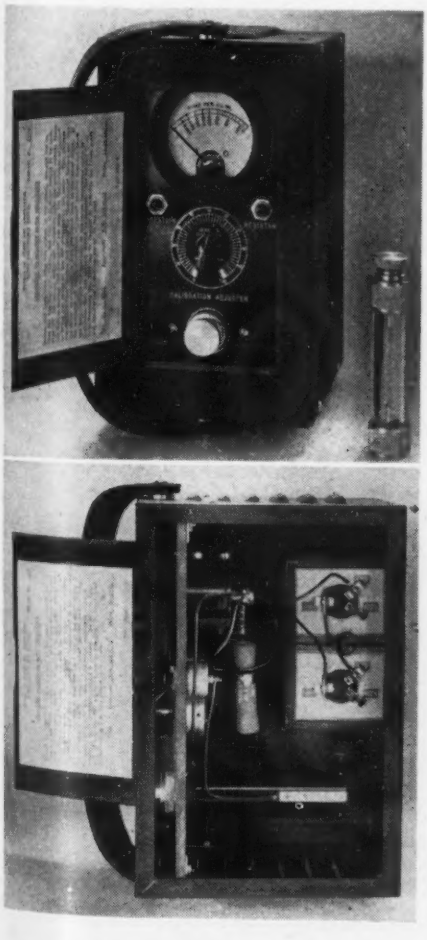
The values of demands on these curves are for groups of 20 to 40 customers. There is general agreement that diversity does not change much above 20 services. These factors and their combination with range demand estimates will be compared in a subsequent article of this series on transformer load estimating.

• • •

Wash Water Tests Prevent Flashovers

G. L. HILL
Pacific Gas and Electric Co.
San Francisco

IF FLASHOVERS are to be avoided in "hot" line insulator washing it is imperative that the resistance of the water be checked. Experience of the Pacific Gas and Electric Co. has shown that safe minimum resistance values vary with different types of insulators. For this reason it is important that each washing crew carry a resistance measuring instrument. The need has been met by the simple and comparatively inexpensive test set shown.

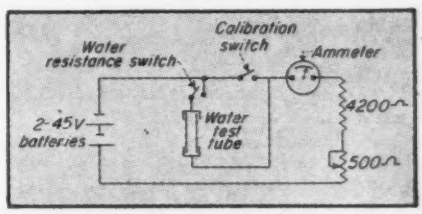


RESISTANCE MEASURING INSTRUMENT for testing water to be used in "hot" line insulator washing. Test sample is placed in Lucite tube receptacle shown. Spacing of electrodes was determined by experiment to give readings directly in ohms per inch cube. Metal parts are all of same material to avoid error due to galvanic action

No instrument was found that met the requirements of simplicity and portability, so one was built. It uses the same principle as the d.c. ohmmeter except that a higher d.c. voltage is used to reduce the error due to polarization to a negligible quantity. The meter used is a 10-milli-amp. d.c. ammeter and is scaled to read the resistance of the water sample directly in ohms per inch cube.

Resistance of the water to be used is obtained by filling the receptacle shown in one of the photographs, inserting it in the socket, pressing the button marked "Resistance" and reading the result. Provision is made for calibrating the instrument by pressing a button marked "Calibration" and adjusting the rheostat to bring the pointer to the zero position on the scale.

Insulator washing water is obtained from all manner of locations, such as substations, farm houses, irrigation pumping plants, etc., and resistances found have varied from 180 to 5,000 ohms per inch cube. Tests showed that on some types of insulators, when clean, 200-ohm water could be used, while on others a resistance of 900 ohms is required. Greater values must be used in practice, the amount depending on the contamination on the insulators.



CIRCUIT DIAGRAM of instrument for measuring resistance of water samples

• • •

CORRECTION

Labels "Before" and "After" should be reversed on curves of Fig. 3 in the article "Brief Absorption Test Index of Dielectric Condition," by Roland Blackway of Philadelphia Electric Co., published in ELECTRICAL WORLD, April 12, beginning on page 101. As shown, the top curve is labeled "After" but should be "Before," and vice versa for the lower curve.

How to Set an 80-Ft. Pole by Aid Of an Ordinary Truck Derrick

PROBLEM: To raise and place 75- and 80-ft. poles with ordinary construction truck equipment. Height of derrick not sufficient to attach near weight center of pole for proper balance in raising

SOLUTION: A 600-lb. weight attached to the pole just above the ground line point helped maintain balance. A temporary or nearby distribution pole was used as a "gin." A second truck was chained to the derrick truck to keep its front end on the ground

USED: In erection of three miles of 66-kv. line along a street of Beloit, Wis. Ray Graff, construction foreman, Wisconsin Power & Light Co., supervised the erection with no accidents. Three stages in the raising of one pole are shown in accompanying illustrations.

START of pole raising operation. By low derrick attachment the long pole becomes "top heavy." A 600-lb. casting fastened near butt end aids in balancing while a nearby distribution pole serves as a gin. Front end of construction truck is held down by added weight of hole borer truck. Erecting crew guides and helps balance the pole

POLE IS RAISED to height limit of truck derrick

AT THE MOMENT the pole is about to settle into hole

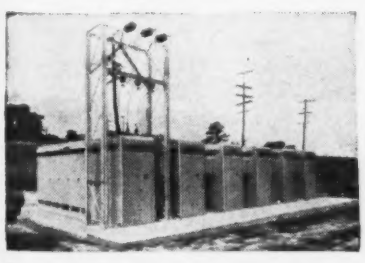
KILOVAR ECONOMICS #4

Johnny says:

"As system designers turn to interconnections and heavier line loadings to deliver more power with less plant, they are finding that kilovars must be given more consideration. All the penalties from kilovar transportation become exaggerated. Distances are greater. Losses are more important. Regulation becomes critical."

The philosophy of dealing with kilovars and kilowatts as two independent commodities, long used by load dispatchers, provides a practical and straightforward means of analyzing and designing systems. Under this concept, it becomes entirely logical to produce kilovars by auxiliary means, such as capacitors, at or near the load and thereby release line capacity for carrying additional kilowatts of pay load.

Capacitors, therefore, have become one of the most important economic tools available to the system planner and designer in meeting the pressure to deliver more power at lower cost. Capacitors make it possible to deliver 10, 15, or 20 per cent more kilowatts without increasing total amperes flowing through the system. Where voltage drop limits loadings, capacitors can reduce it to an unimportant factor. They can cut cost of power purchased through interconnections. And, while doing all these, they lower the total system investment per kilowatt of capacity—and reduce copper losses by a quarter to a third.



A General Electric field representative will be glad to explain in further detail the specific advantages of applying capacitors to *your* system. Write to *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

HERE IS *the dollar and cents side*

OF CAPACITORS

When kilovars are supplied by capacitors at or near the load, from 2 to 6 per cent of the system investment is chargeable to this non-revenue-producing load. When kilovars are generated at the central stations, and supplied over a system designed primarily to deliver kilowatts, 20 to 25* per cent of the total investment is tied up.

*For systems operating at about 80 per cent power factor.

8 MILLION KILOVARS OF CAPACITORS NOW USED IN THE UNITED STATES

Users of capacitors for on-the-spot kilovar generation include these outstanding utility companies: Central Maine Power Company, with 23 per cent of its peak load in capacitors; Tampa Electric Company—20%; New Orleans Public Service Inc.—21%; Brockton Edison Company—34%. Each of these companies is enthusiastic about capacitors *as a means of cutting down system investment!*

GENERAL ELECTRIC

407-116

Check Electrical Characteristics Of Fluorescent Lamp Circuit . . . II*

HARRIS REINHARDT
Manager, Commercial Engineering Dept.
Sylvania Electric Products Inc.
Salem, Mass.

MOST IMPORTANT electrical characteristics of a fluorescent lamp circuit to be measured in the field are: (1) Line voltage; (2) open-circuit voltage; (3) starting (i.e. electrode preheating) current; (4) lamp-operating voltage; (5) lamp-operating current.

Fig. 1 is a circuit diagram of a kit to measure items 2, 3 and 4 by simply replacing the two-contact type starter in the lamp circuit with the dummy starter connected to the test kit. As will be discussed under the appropriate heading (in an ensuing issue), this kit also measures line voltage on circuits with certain types of ballasts and can be used with an adapter (Fig. 2) to measure lamp operating current. Range of the meters makes the kit suitable for ballasts for fluorescent lamps in sizes from 15 to 40 watts (including the 32-watt circular lamp).

Fig. 3 connections are used for 100-watt lamps which employ a four-contact type of starter and permit the direct measurement of lamp operating current. Ammeter range 0 to 3 amp.

The values of currents and voltages given in the tables apply to measurements made under accurately controlled (such as laboratory) test conditions which include:

1. Accurate control of the line voltage at the center of the range for which the ballast has been designed.

2. The use of standard lamps which have been carefully selected and aged to insure uniformity.

3. A warm-up period sufficient to insure stable ballast and lamp performance.

4. Accurate control of surrounding temperature at 80 deg. F.

For measurements under field conditions, the values given in the tables should be thought of as representing the general order of magnitude which should be expected rather than as strict limits within which the values must fall. The chief value of such measurements lies in the fact that they provide a method of making certain that definitely abnormal electrical conditions do not exist.

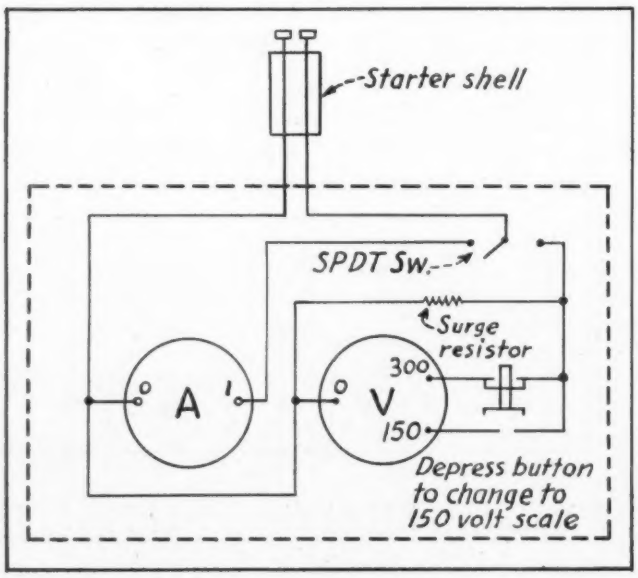


FIG. 1—Test kit for 15 to 40-watt lamps

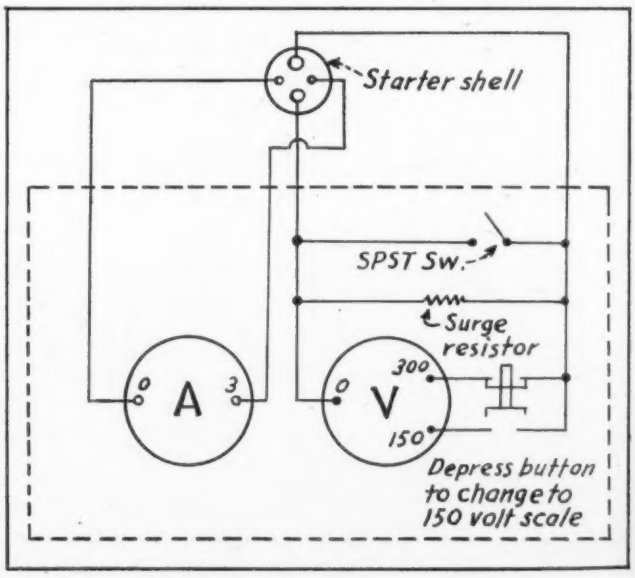


FIG. 3—Test kit for 100-watt lamps

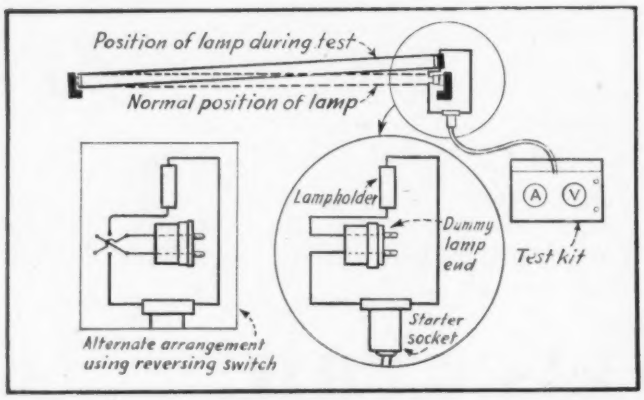


FIG. 2—Adapter for measuring operating current

Table I—Values for 15 to 40-Watt Lamps

Lamp Size	Optimum Open-Circuit Voltage	Preheat or Starting Current Range, amp.	Arc or Lamp Voltage Range
15W/T8	118	0.44–0.65	54–58
15W/T12	118	0.44–0.65	46–50
20W/T12	118	0.44–0.65	60–64
30W/T8	200	0.40–0.65	100–106
40W/T12	200	0.55–0.75	105–111

Table 2—Values for 100-Watt Lamps

Lamp Size	Open-Circuit Voltage	Preheat or Starting Current Range, amp.	Arc or Lamp Voltage Range	Lamp Operating Current Range
100W/T17	150	1.35–2.20	70–75	1.40–1.50

* A method for checking a fluorescent fixture when a lamp fails to light was outlined in ELECTRICAL WORLD, May 10, 1947, page 108.

COST YOUR PLANT $1000 AN HOUR?

NOT IF YOU MAKE SURE OF YOUR 'IC'

(Interrupting Capacity)

HERE'S HOW . . .

KNOW THE "IC" OF YOUR LOW-VOLTAGE PROTECTIVE DEVICES

The "IC" (interrupting capacity) of a circuit breaker or other interrupting device is the maximum current it is rated to *adequately* interrupt. It is essential that you know the "IC" of your protective devices.

BE SURE THE "IC" IS ADEQUATE TO INTERRUPT MAXIMUM SHORT-CIRCUIT CURRENTS

Maximum short-circuit current is *not* determined by the normal load on the circuit. The total capacity of the transformers feeding the circuit is the critical factor. In the adjoining table, check your transformer capacity against the "IC" corresponding to your particular circuit voltage. The "IC" of your protective devices should be equal to or greater than the short-circuit currents available as determined by your transformer capacity.

IF YOU NEED MORE "IC", INSTALL G-E AIR CIRCUIT BREAKERS

It's easy to select the proper G-E air circuit breaker from the table. And you can be sure they have adequate "IC" to safeguard your production, equipment, and personnel. By providing three-phase interruption of dangerous overcurrents, G-E breakers eliminate the possibility of single-phasing damage to motors. Workmen can operate these breakers easily and safely. A turn of the handle and power is restored—no parts to be replaced.

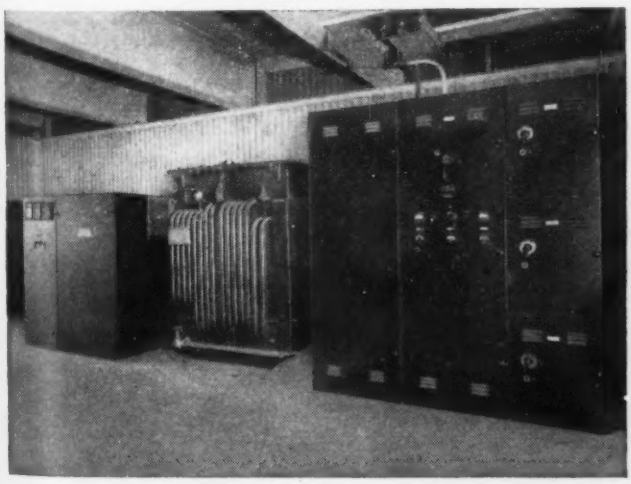
Write for the bulletins listed below, or contact your G-E sales representative. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

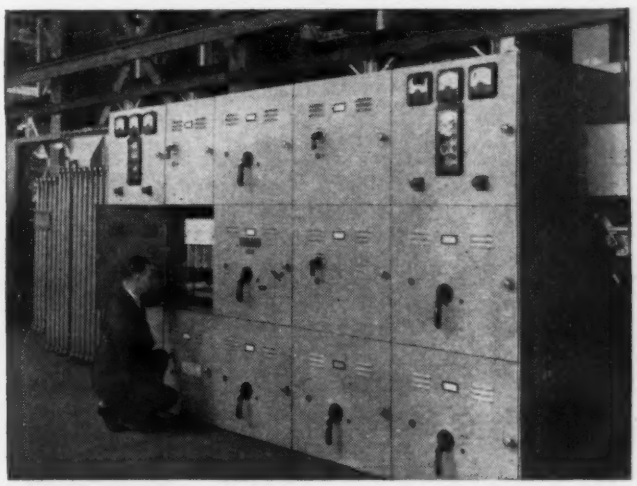
GEA-3600 Air Circuit Breakers

GET-1113 The Selection and Application of Air Breakers

GEA-3592 Load-center Unit Substations

GEA-2596 Low-voltage Drawout Breaker Equipment





G-E air circuit breakers are available not only as individual wall-mounted units, but also as an integral part of complete load-center unit substations.

GENERAL ELECTRIC

860-30

Printed Circuit Wiring for Miniature Controls

CLEDO BRUNETTI
and PHILIP J. FRANKLIN
National Bureau of Standards
Washington, D. C.

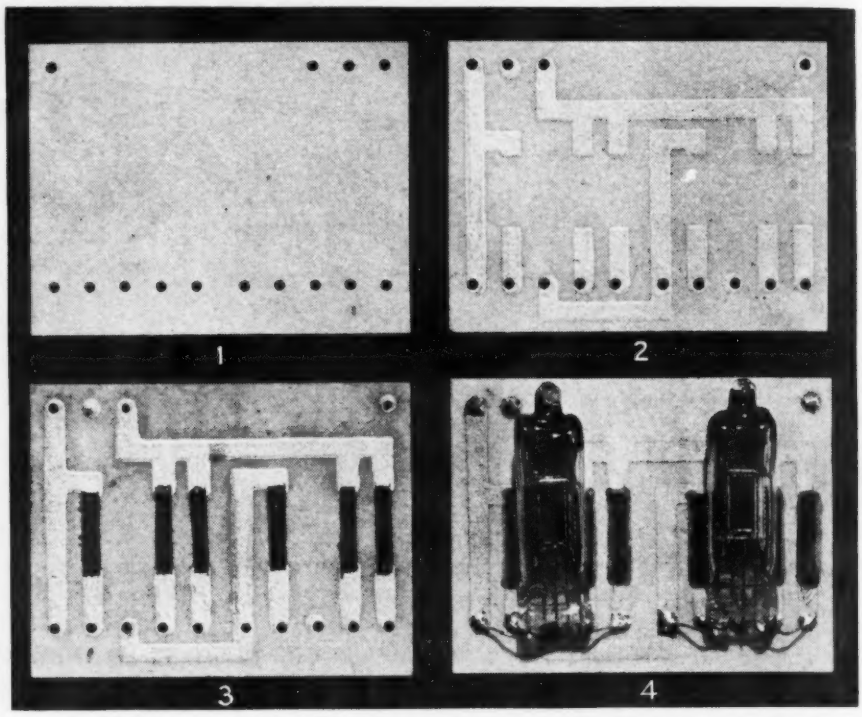
A METHOD of printing wiring and electrical circuit components on an insulated surface has been developed by the National Bureau of Standards in cooperation with electronic manufacturers. Originally developed for war-time use in generator-powered radio proximity fuses, the method is applicable to industrial and commercial circuits where ruggedness and small size are imperative.

Four simple techniques are the key to the process. *First*, the circuit wiring and inductors are painted or stencilled with silver paint on a chassis or base material such as steatite. *Second*, resistors in the form of a carbon and resin mixture, are stencilled or sprayed on the plate through masks that locate them accurately. *Third*, small disc-type capacitors, of high dielectric ceramic, are then applied directly to the wiring on the plate. *Last*, other components, such as tubes, are fitted into properly located holes in the ceramic and soldered in place. A compact electronic circuit assembly results that is readily adaptable to high production techniques.

Any insulating surface, glass, porcelain, plastics, cloth, paper, etc., may be employed as a base plate for the wiring. Steatite, a hard and dense ceramic material, is well suited for this use.

The circuit to be printed is applied to the ceramic, either directly with a brush or by using a silk or metal stencil. The stencil may be produced by coating a silk (or metal) screen with a substance such as gelatin or polyvinyl alcohol that has been made photosensitive by treating with potassium dichromate. A sheet of paper bearing the desired wiring pattern is held tightly against the sensitized screen and exposed to strong light. Exposure fixes the chemicals on the screen; when the sensitized screen is washed in water, parts not exposed to light dissolve, leaving lines in the screen corresponding to the desired wiring diagram.

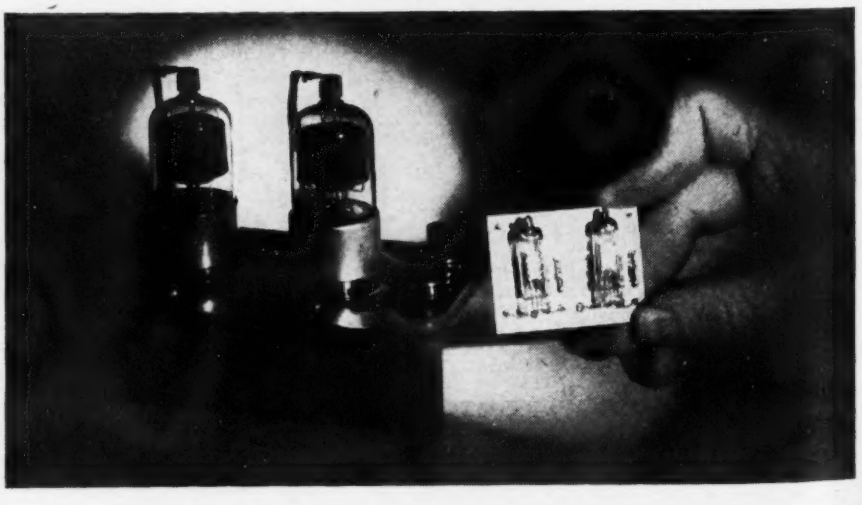
This stencil is laid over the ceramic plate and silver ink brushed into it. An impression results on the plate that is exactly like the circuit wiring but with silver lines instead of copper wires. The silver paint consists of very finely divided silver or silver oxide mixed with a binder to make a paste and thinned with a solvent such as acetone. Plate with pattern is heated to between 1,300 and 1,500 F., bonding the silver to the ceramic.



FOUR STEPS in printing an electric circuit are shown above. Steatite plate (1) ready for application of circuit. Plate (2) with circuit wiring consisting of silver oxide paint, and later (3) with addition of resistors. Finally assembled unit (4) complete with miniature tubes

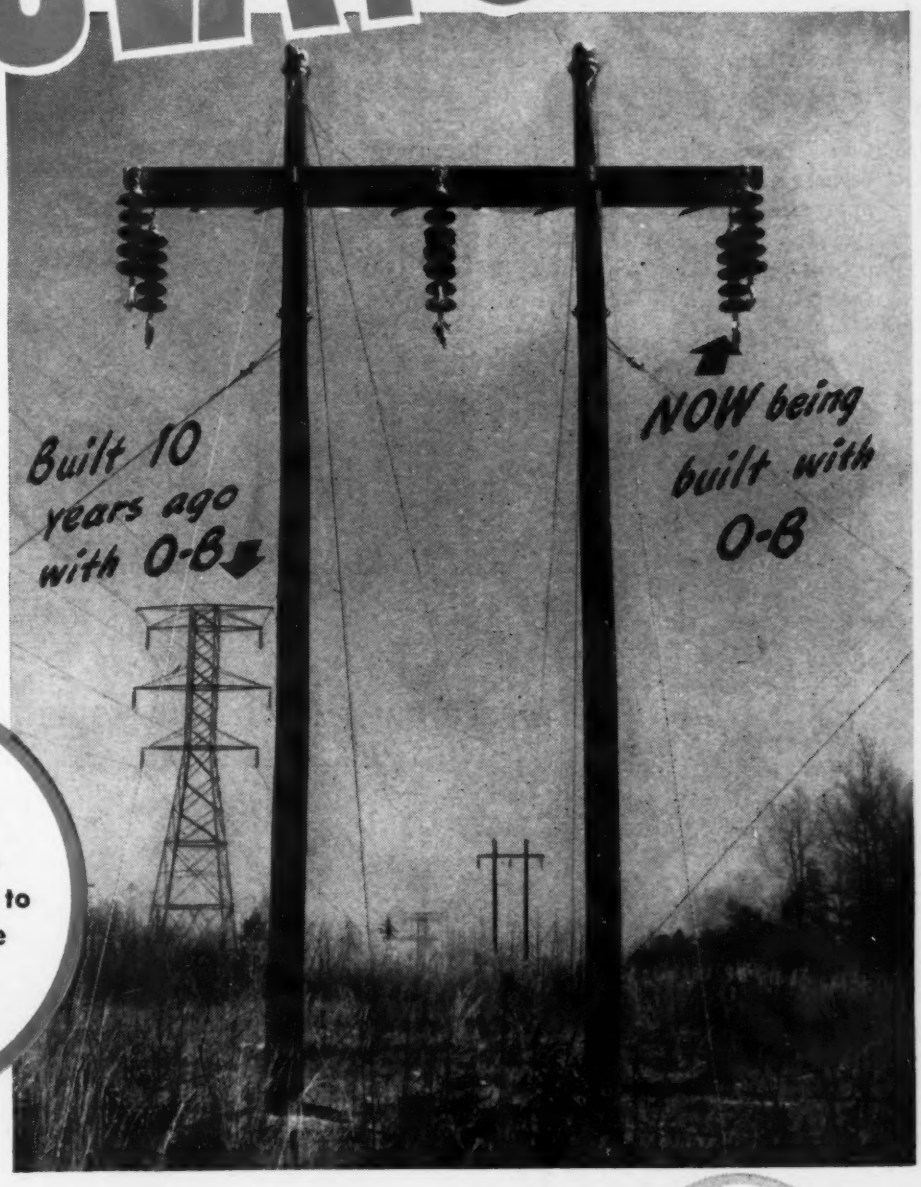
Resistors are sprayed or painted through another stencil into their proper places or brushed on with a brush. The resistor paint consists of a conducting material such as powdered graphite, and an inert material such as mineralite or powdered mica. Resistance may be varied by altering the amount of inert filler or selecting the length, width and thickness. After applying the resistor paint the plate is

SIZE COMPARISON between a two-stage amplifier constructed according to conventional practice and a miniature amplifier for use with subminiature tubes



YEAR AFTER YEAR—

INSULATORS



...this power company has the soundest possible reason for continuing to make O-B its choice of insulators on this new line.

Ohio Brass

2747-H

MANSFIELD, OHIO

Canadian Ohio Brass Company, Limited
Niagara Falls, . . . Ontario

HEADQUARTERS FOR PORCELAIN INSULATION

heated at 300 F. to cure so that the resistor values will not change. A resin coating is then applied to protect the resistors against humidity and other effects.

High-dielectric capacitors may then be soldered in position using a low-temperature solder. Subminiature vacuum tubes complete the assembly.

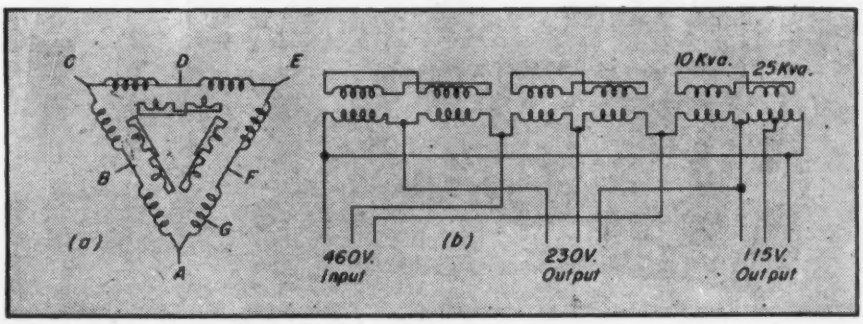
• • •

Bank Improvised from Available Transformers

B. R. ASKEW
Industrial Power Engineer
Georgia Power Co.
Atlanta, Ga.

WITH THE PRESENT scarcity of transformers, some unusual arrangements have been resorted to in meeting immediate or emergency conditions. In one such instance 460-volt, 3-phase service was being supplied for approximately 200 kva. actual construction load, and it was necessary to provide a total of 35 kva. at 230 volts, 3-phase for additional small power loads, and 6 kva. of single phase lighting. The contractor had three 10-kva., and three 25-kva., standard distribution transformers rated 115/230 to 2,300 volts. To obtain 460 to 115/230-volt transformers would have delayed construction over thirty days.

The six distribution transformers were connected as shown in accompanying sketch and the 115/230-volt service secured. By watching the loadings on the various transformers, under this arrangement a 3-phase, 230-volt capacity of 60 kva. readily can be secured. The 115 volts single phase is further obtained from any one of the 25-kva. transformers.



PARALLELING of unused primaries of 2,300-volt transformers (three 25-kva. and three 10-kva.) permits delta source of 230/115 from 460-volt supply on autotransformer connection

The use of the secondary of the transformers as auto transformers or balancing coils has often been done, but in this case it will be noted that an auto transformer is being made out of two separate units with separate cores. It is necessary to secure the equivalent of a common core in each phase by connecting the 2,300-volt windings in parallel, otherwise voltage collapses when load is applied.

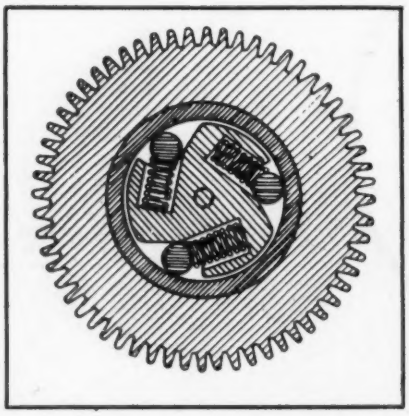
• • •

Uni-Directional Clutch for Demand Registers

H. O. COGGESHALL
Meter Tester
Distribution Operation Department
Consolidated Edison Co.
Of New York, Inc.

APPLICATION of a uni-directional roller clutch assembly* to the storage train of the Sangamo type HGC cumulative demand register has been effected through the cooperative efforts of the Sangamo Electric Co. and Consolidated Edison Co. of New York, Inc., as a factor in extending the servicing schedule for high cumulative ratio registers.

The frequency of periodic servicing of demand registers is an important element in over-all costs, and the modification of design described here will lengthen the required servicing period, particularly for those registers with the higher cumulative ratios. (The cumulative ratio is the ratio between the demand storage wheel and the first, or fastest moving, kilowatt dial shaft.)



THREE-ROLLER RATCHET serves as a uni-directional clutch

In the original design a conventional friction clutch was provided in the storage train. The slipping of this clutch during a monthly reset operation permitted one section of the storage train to be returned to its original zero position, while the other section of the same train was locked in its cumulatively advanced position.

The inherent design of the register was such that in the process of slipping this clutch, stresses were set up in the reset train proportionately to the cumulative ratio of the register. The normal accumulation of friction in the clutch caused stresses to increase more rapidly in registers with high cumulative ratios.

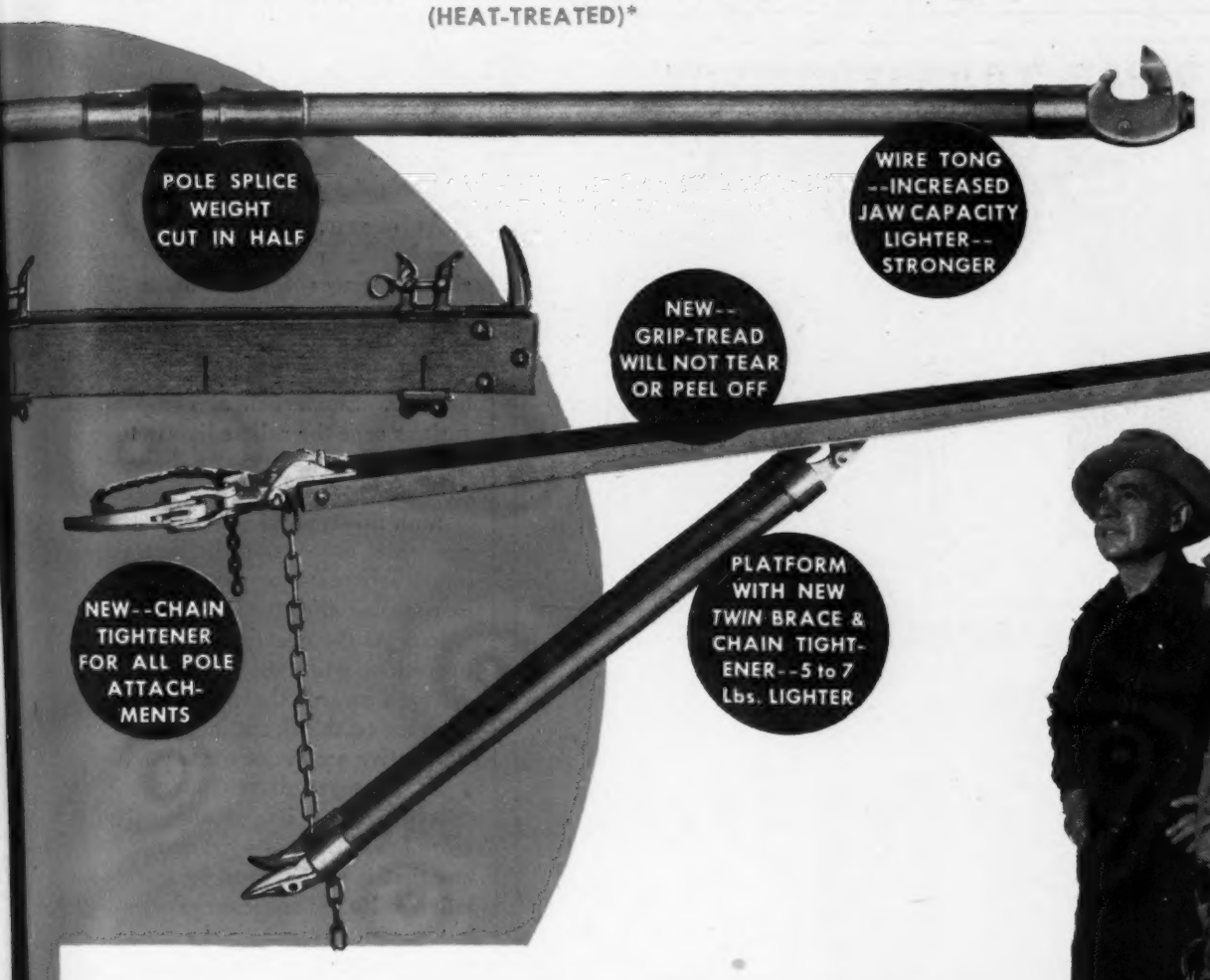
Over a period of years these stresses in the high cumulative ratio registers could increase sufficiently to produce

*Editor's Note—Mr. Coggeshall recently earned an award from the suggestion committee of Consolidated Edison Co. for his application of a uni-directional clutch in cumulative demand registers.

In "HOT STICK" History!..

with ALUMINUM Alloy Fittings

(HEAT-TREATED)*


POLE SPLICE WEIGHT CUT IN HALF
WIRE TONG --INCREASED JAW CAPACITY LIGHTER-- STRONGER
NEW-- GRIP-TREAD WILL NOT TEAR OR PEEL OFF
NEW--CHAIN TIGHTENER FOR ALL POLE ATTACH-MENTS
PLATFORM WITH NEW TWIN BRACE & CHAIN TIGHT-ENER--5 to 7 Lbs. LIGHTER

Reduced Weight Makes Hot Line Work
FASTER • EASIER • SAFER

Linemen, foremen, superintendents and safety directors who have handled these new Chance tools are enthusiastic about the many points of superiority they offer over all previous hot line tools.

Amazing weight reduction, with increased strength is made possible through the use of cast aluminum alloy fittings. Tests prove that a very slight difference in the weight of a tool head makes a considerable difference in the effort required to handle the tool from the butt end. This reduced weight minimizes fatigue and helps linemen do their work more quickly and efficiently and with less effort.

Some of the outstanding features of the new tools are indicated in the illustrations above. Extra strength—reduced weight—improvements in design—all mean faster, easier, safer line maintenance work.

Chance Aluminum Alloy Fitted Tools are now in production and will be available soon.

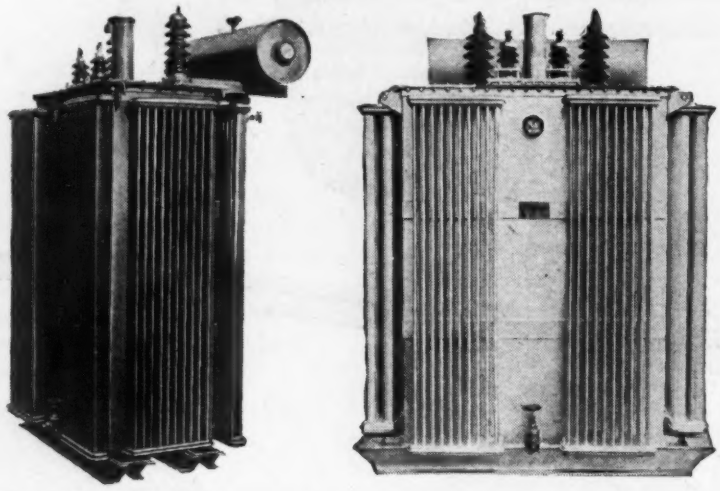
A·B·CHANCE CO·

CENTRALIA, MISSOURI · SAN FRANCISCO, CALIFORNIA

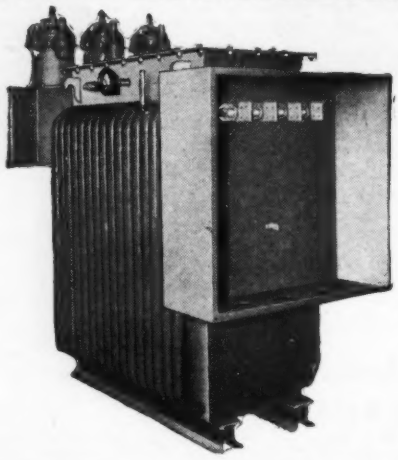
abc INDUSTRIES

DAVIS TRANSFORMERS

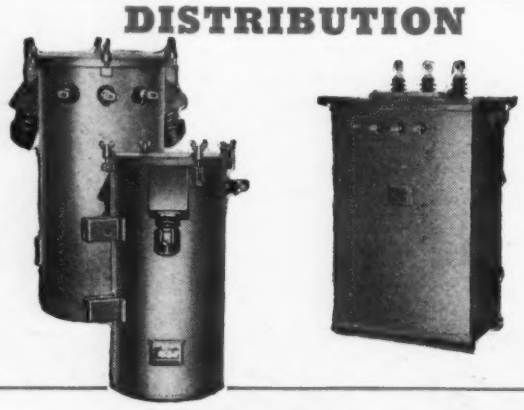
POWER TRANSFORMERS



SPECIAL APPLICATIONS



DISTRIBUTION



DAVIS TRANSFORMER COMPANY

DAVIS TRANSFORMER CO.

Phone 177 CONCORD, N. H.

MANUFACTURERS OF OIL COOLED, DRY TYPE, POWER AND DISTRIBUTION TRANSFORMERS

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION NEMA MEMBER

distortion of the intermediate lever assembly and sector gear in the reset train. Any distortion of these parts was reflected in the accuracy of the register.

To prevent this distortion a unidirectional clutch has been inserted in the storage train. This clutch is, in effect, a three-roller ratchet arrangement of an existing design which can be slipped with a minimum of effort in a backward direction, but which grips solidly at any point when driven in a forward direction.

As shown in the accompanying sketch, the rollers ride in wedge-shaped spaces formed by a three-point cam that is staked to the shaft and enclosed by a drum. The drum and driven-gear are staked to a sleeve bearing. Small helical compression springs urge the rollers lightly toward the apex of the wedge-shaped enclosure.

With this type of clutch in the storage train, the section of the train up to and including the clutch drum may be returned effortlessly to its zero position. At the conclusion of the reset operation, when the storage train is driven forward, the rollers will lock the cam to the drum, advancing the cumulative section of the train.

The positive drive feature of the clutch permits its installation in a more advantageous point in the train, one that is not affected by the cumulative ratio. Thus the effort which is transmitted through the reset train is minimized and is the same for all register sizes.

•

Composition of Somastic Pipe-Coating

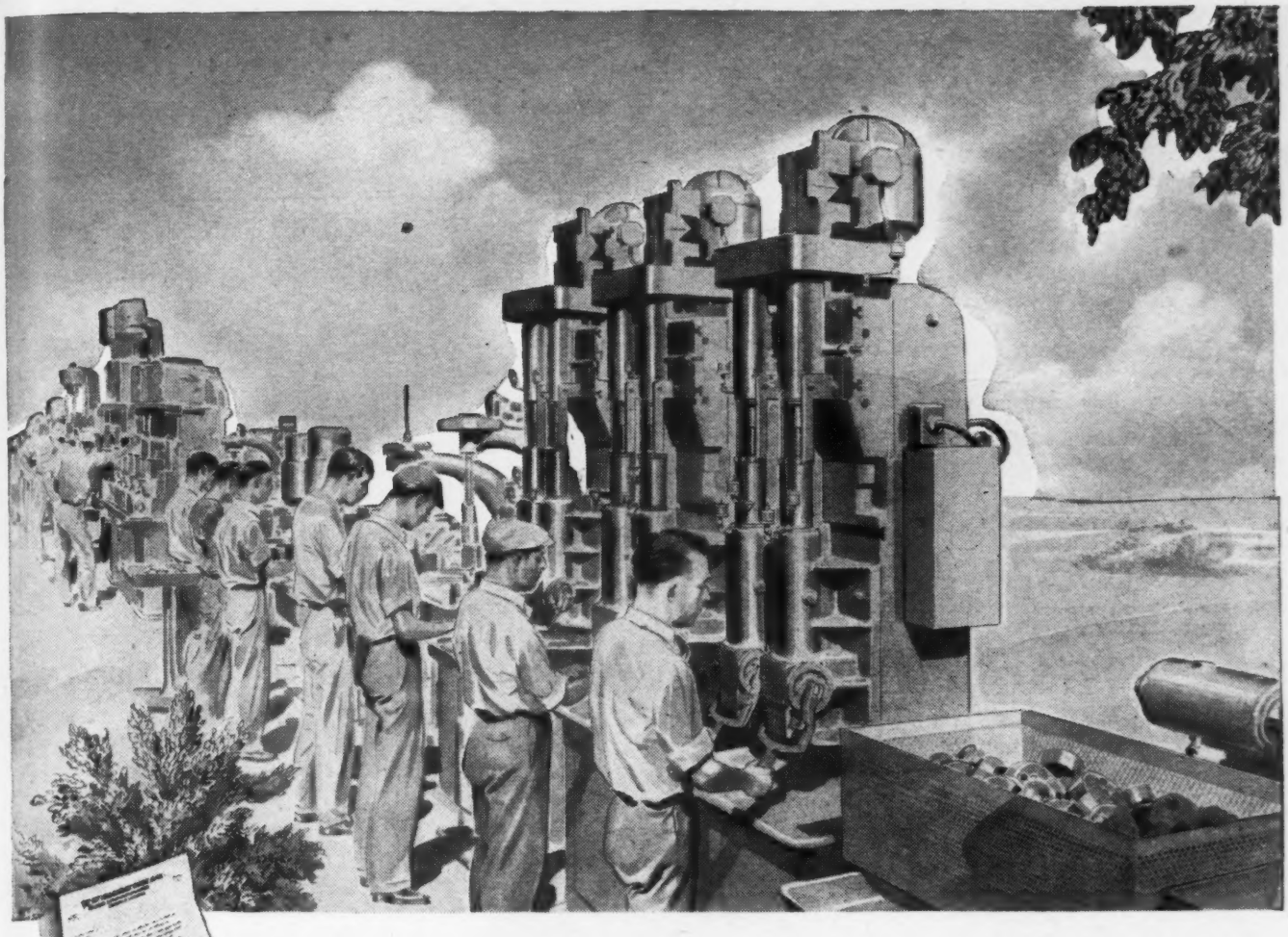
FOR PROTECTION against corrosion the 5 9/18-in. steel pipe housing the 5-mile, 110-kv. Oilostatic cable* was coated with Somastic, an asphalt-mastic preparation developed by Standard Oil Co. of California. It is manufactured and applied by the Industrial Engineering Co. and consists of the following ingredients:

1. Air-blown asphalt from selected crudes (approx. 12 percent by weight).

2. Non-micaceous washed sands, carefully graded, all passing Tyler Standard No. 6 screen (approx. 63 percent by weight).

3. Finely ground mineral filler

* See ELECTRICAL WORLD, May 10, 1947, page 84.



"Like moving your plant outdoors"

IT took a lighting engineer to put into words the improvement made in the average industrial plant by a clean, fresh coat of white paint on walls and ceilings. Said he in describing a job recently done in one plant with Barreled Sunlight:

"It's like moving your plant outdoors!"

That's really an excellent description, for white ceilings and walls reflect and distribute artificial illumination just as the sky reflects and distributes natural sunlight outdoors.

By reflecting a maximum of light (80 to 90%—far more than paint of any other color) white ceilings and walls help make even the finest lighting system more efficient.

And by *distributing* it evenly throughout the entire working area they help to banish those three arch-enemies of good seeing: glare, harsh shadows and extreme contrasts in brightness.

For nearly half a century, Barreled Sunlight whites have been helping to make good lighting better. For down-to-earth data on the partnership of Light and Paint in creating good seeing conditions, send today for free copy of our 32-page booklet, "Light and Color in the Work-World."

U. S. GUTTA PERCHA PAINT COMPANY
14E Dudley Street, Providence 1, R. I.

I'd like to know more about the partnership of Light and Paint. Please send me your free 32-page booklet, "Light and Color in the Work-World."

COMPANY.....

STREET AND NUMBER.....

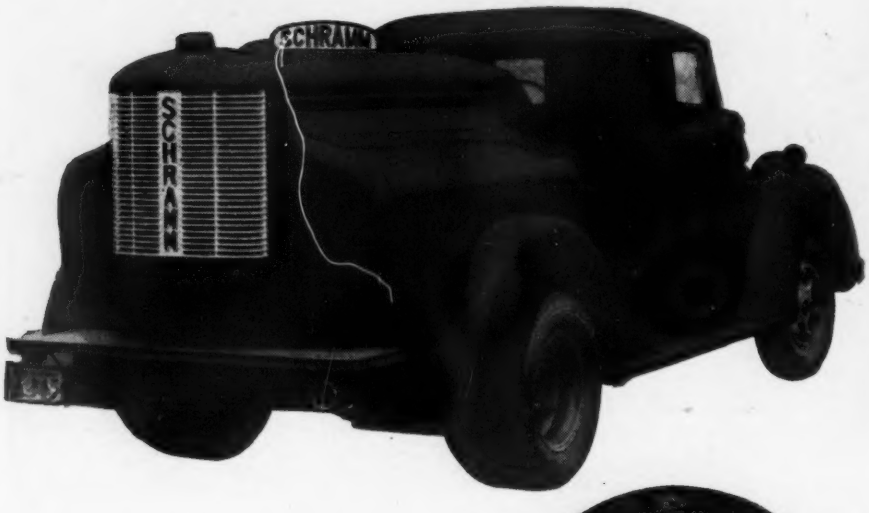
CITY..... ZONE..... STATE.....

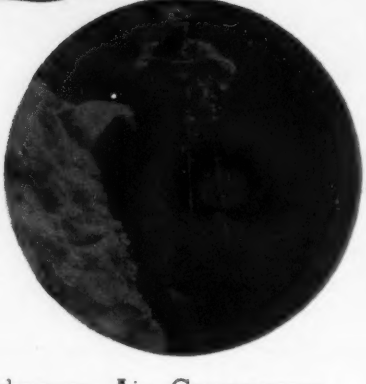
MY NAME IS.....

MY TITLE.....

© 1947 U. S. Gutta Percha Paint Company

Utilities use
SCHRAMMS
on jobs like these





Three of many uses for Schramm Air Compressors in the Utility field! First, second and third are all hard jobs . . . but done easily, quickly, economically when Schramm is furnishing the air.

Schramm Air Compressors offer features to give a continuous flow of air with minimum maintenance: (1) 100% water cooled (2) Forced Feed Lubrication (3) Mechanical Intake Valve (4) Compact, lightweight.

Schramm units range in size from 20 to 420 cu. ft. actual air. For full details and construction features write us today

Let **SCHRAMM** *help you on your compressed air job!*

SCHRAMM INC. THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA

(limestone) free from dirt or foreign matter (approx. 24 percent weight).

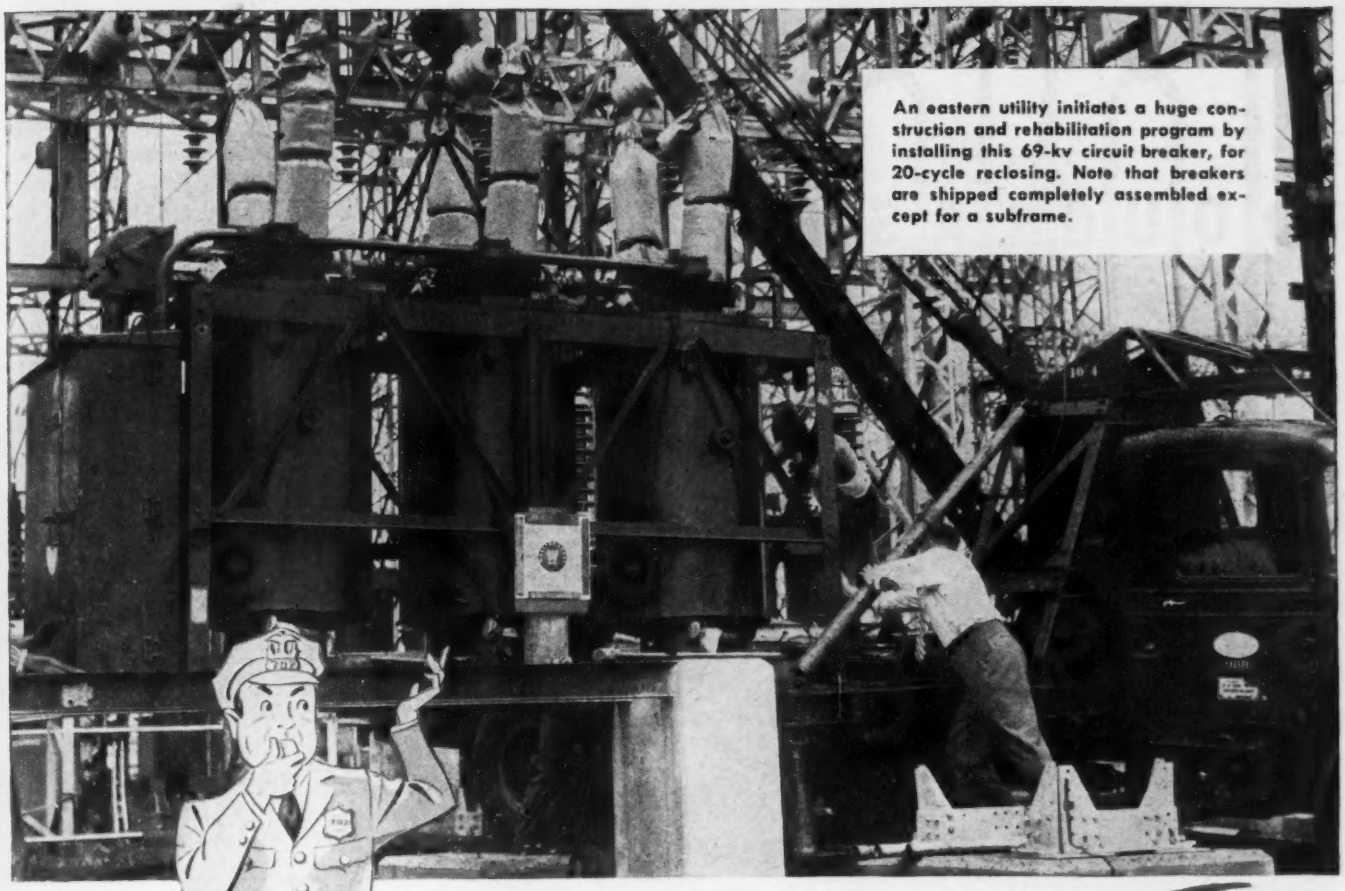
4. Long willowed asbestos fibre free from dirt, grit and moisture (approx. 1 percent by weight).

Mobile Power For Portable Drills

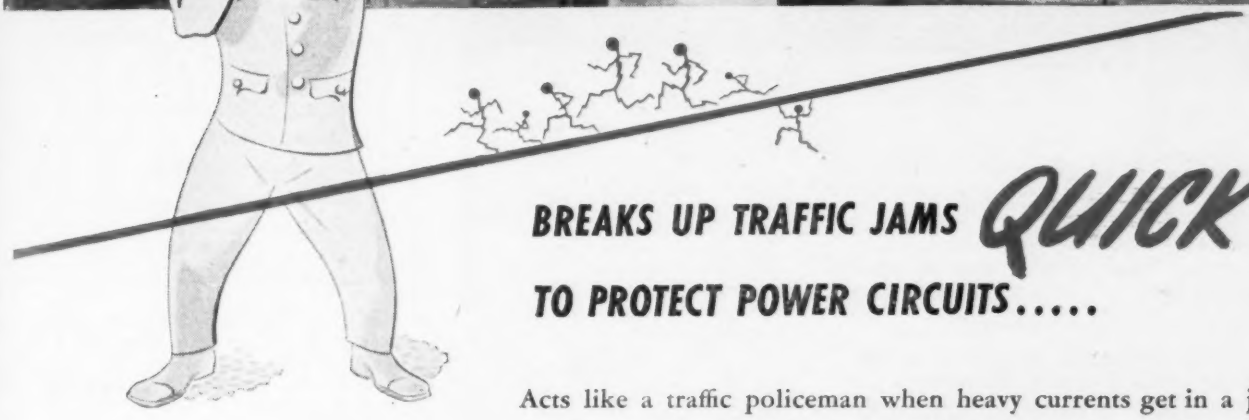
ON-THE-JOB power effected substantial construction economies for Agater Electric Co., contractor building an H-frame, wood-pole, 230-kv. line in northern Washington for the Bonneville Power Administration. For the structure shown the 1,500-watt, 115-volt, a.c. power supply unit was on a truck in a canyon 450 ft. away. A reel of No. 10, two-conductor, rubber-covered cord enables working two portable drills at this distance. Both poles in the structures are framed in the air and each requires five holes to be bored; one for the through bolt, two for crossarm guys and two for the K-brace

High Dielectric Constant

A NEW electric-insulating material of ultra-high dielectric permeability—barium titanate—has been discovered and adapted by B. M. Vuhl, Corresponding Member of the Soviet Academy of Sciences of the U.S.S.R. Research on the development of a new type dielectric was started in 1930. Dielectric constant of barium titanate exceeds 1,000 and under certain conditions shoots up to a 10,000



An eastern utility initiates a huge construction and rehabilitation program by installing this 69-kv circuit breaker, for 20-cycle reclosing. Note that breakers are shipped completely assembled except for a subframe.



BREAKS UP TRAFFIC JAMS QUICK

TO PROTECT POWER CIRCUITS.....

Acts like a traffic policeman when heavy currents get in a jam on power circuits. Breaks dangerously overloaded circuits in eight cycles. Westinghouse Outdoor, Frame-Mounted Oil Circuit Breakers police the system and improve service continuity.

They quench arcs quickly in exclusive "De-ion" Grids. High-speed magnetic action sweeps arc products from path of the arc. The combined action speedily deionizes arc zone . . . reduces fault clearance time, contact burning and oil deterioration, with resultant lower maintenance costs.

All parts are accessible for easy inspection or servicing. Even lowering and raising oil-filled tanks is a one-man operation with a windlass-type tank lifter.

Frame-Mounted, "De-ion" Grid Oil Circuit Breakers are thoroughly tested in the Westinghouse High-power Laboratory before shipment. They are factory-assembled with condenser bushings and contacts in place to simplify installation. For complete details, write for Booklet B-3686. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

3-09644

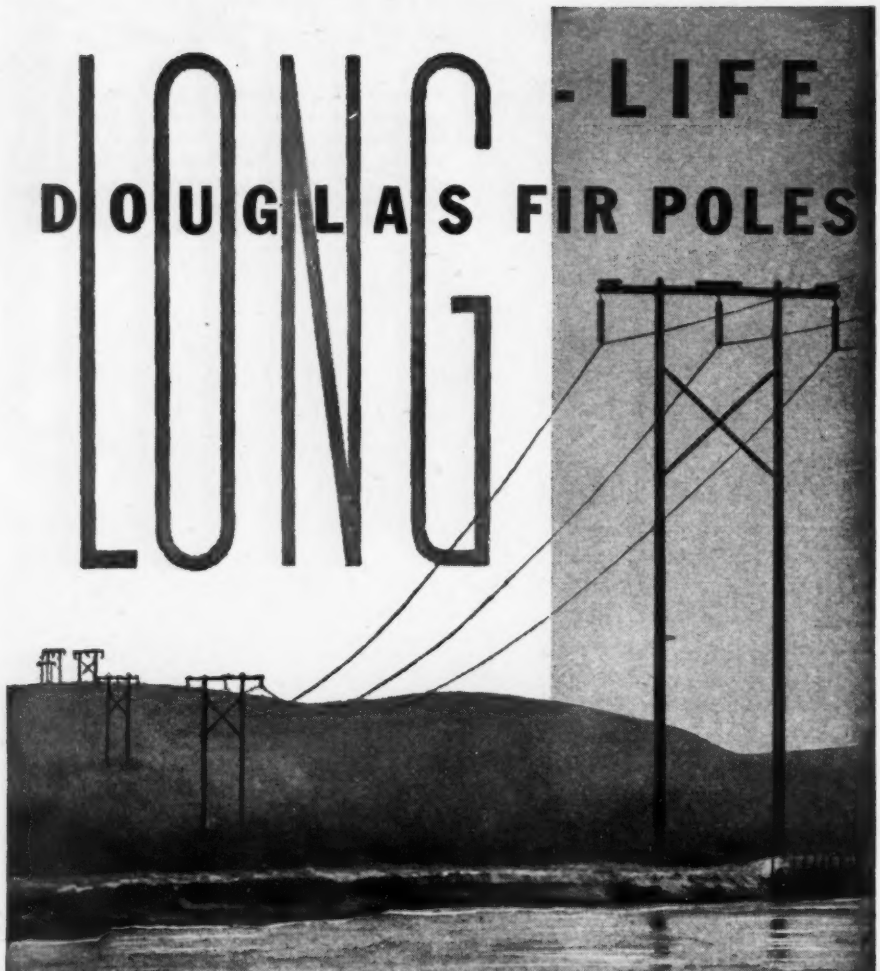
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

OUTDOOR, FRAME-MOUNTED OIL CIRCUIT BREAKERS

15 to 69 kv • 600 to 4000 amperes • 500,000 to 1,500,000 kva

LONG-LIFE
DOUGLAS FIR POLES



Our specialty is long-length Douglas Fir poles, pressure treated for Long-Life service. Prompt shipments of reasonable quantities can now be made in most lengths from 60 foot to 125 foot. Direct rail shipments out of our treating plant stocks can be made to any point in the United States. Write or wire us your inquiries.

Pressure treated Douglas Fir poles have been for years the standard in pole line construction on the West Coast. Our Long-Life Douglas Fir poles meet ASA Specifications and are pressure treated with coal-tar creosote or creosote-pentachlorphenol solution by the empty cell process, 8-lb. retention, in accordance with AWPA Specifications.

Long-Life Douglas Fir poles, pressure treated from high quality Coast-type timber, will cut your maintenance costs and yield longer and more satisfactory service.

Also Produced by J. H. Baxter & Co. of Oregon—*an associated company*
Plant and Yard—Eugene, Oregon

J. H. Baxter & Co.

333 MONTGOMERY STREET • SAN FRANCISCO 4, CALIFORNIA
LOS ANGELES • LONG BEACH • ALAMEDA • CALIFORNIA, U. S. A.

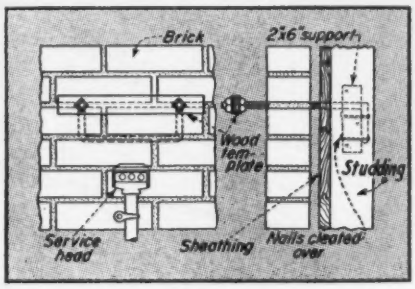
as compared with approximate values of 5 for glass and 10 for mica.

The new dielectric reportedly has been thoroughly tested by a number of Soviet scientific laboratories. The Institute of General and Inorganic Chemistry has conducted a series of experiments to determine the conditions of the work of the barium titanate insulators under temperature changes, and the effect of high pressures on this dielectric, while the Institute of Physical Problems studied the effect of low temperatures on it. The results were reported as highly satisfactory but no details have been revealed.

The new insulating material is expected to be widely used in radio and other branches using high-frequency currents.

•

Service Bracket Suits All Wall Constructions



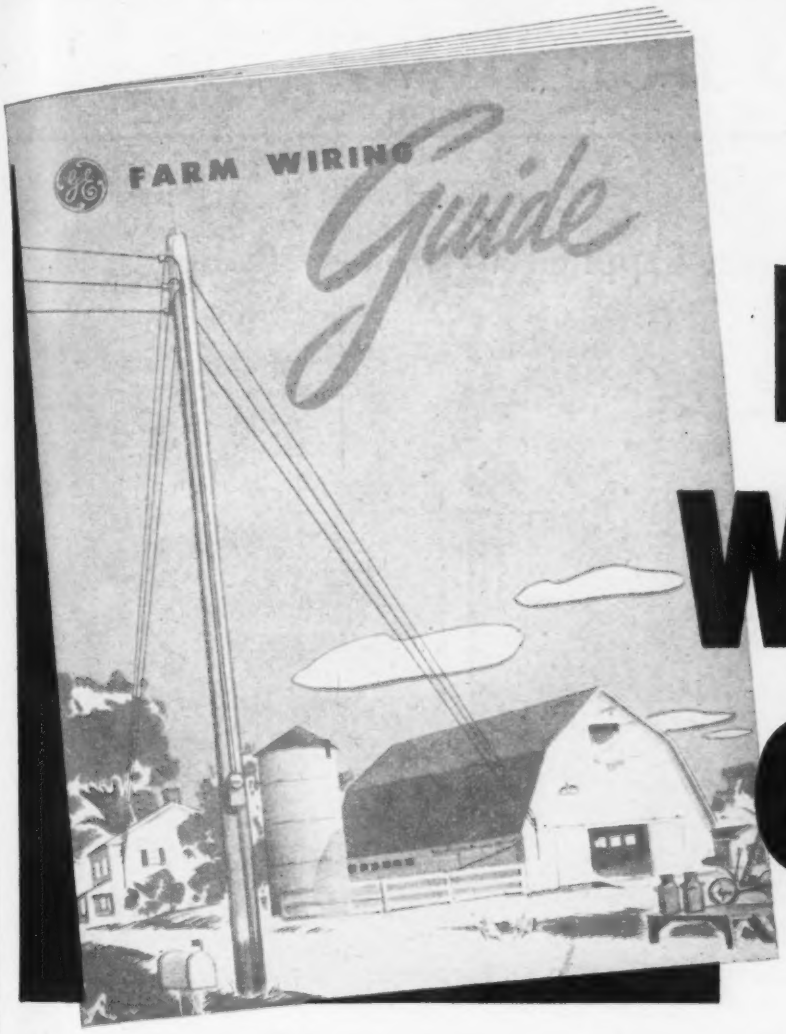
HOOK ARRANGEMENT of service bracket gives anchoring strength in all types of wall construction. It can be used either horizontally or vertically

FOR INSTALLATION of service drops to new buildings, Indianapolis Power & Light Co. furnishes a special service rack anchor to the building contractor. This bracket, shown in the accompanying sketch, installed in wall studding, may also be set into concrete or concrete block walls during construction.

Details of its mounting on brick walls are also shown. A 2-in. by 6-in. support is nailed to the studding to take the tension of the service. A wood template is left in place during the building and installation, and is removed when the final service rack is mounted on the protruding bolts by the company's service crew.

The company has a stock of the special brackets for issue to the contractors when needed.

BUILD YOUR POWER SALES PROGRAM AROUND THIS



FARM WIRING GUIDE

Here's the ideal attention getter for your power program, and here's how it works. The *Farm Wiring Guide* lets your customers—and prospects—study the benefits of better wiring and better power consumption in *their own homes.* It means that — as they read this fascinating booklet — they are constantly translating its message into plans for the modernization of their own farms.

Get General Electric's *Farm Wiring Guide* into the hands of your prospects, and the groundwork of your power sales program is laid for you. It explains in detail just what the electrical requirements are for more efficient farming and easier home life. It even moves them into the planning stage by providing planning pages on which they can draw up their ideas for submission to their contractors. Get set for increased sales by starting your power program rolling now with the *Farm Wiring Guide.*

As a follow-up to the *Farm Wiring Guide,* you'll find the sound slide film, *Wired for Life,* a great help in explaining the advantages of expanded electrical facilities on the farm. It compares farming in "Great Uncle Henry's" day with life on the modern, properly wired farm of today. It's in color, it's timely, and it's a booster for your program.

And, while your load-building program is still young, don't overlook the service values you and your customers get from high-quality wiring materials put in with sound wiring methods. When the question of selecting materials comes up, you know that your suggestion of reliable construction materials is an aid to good service and to reduced maintenance costs. The General Electric line is the reliable line for all wiring needs.

GENERAL ELECTRIC

CONSTRUCTION MATERIALS

Section AW60-527
Appliance and Merchandise Department
General Electric Company
Bridgeport 2, Connecticut

To build my power program, I need:

☐ ____ copies of the *Farm Wiring Guide* cost per copy: 1-100, 10 cents — 100-300, 8 cents — 300-500, 6 cents — over 500, 5 cents — sample copy free.

☐ ____ copies of the sound film strip, *Wired for Life* cost per copy: $25.00

Enclosed is order for the materials indicated
Send them to:

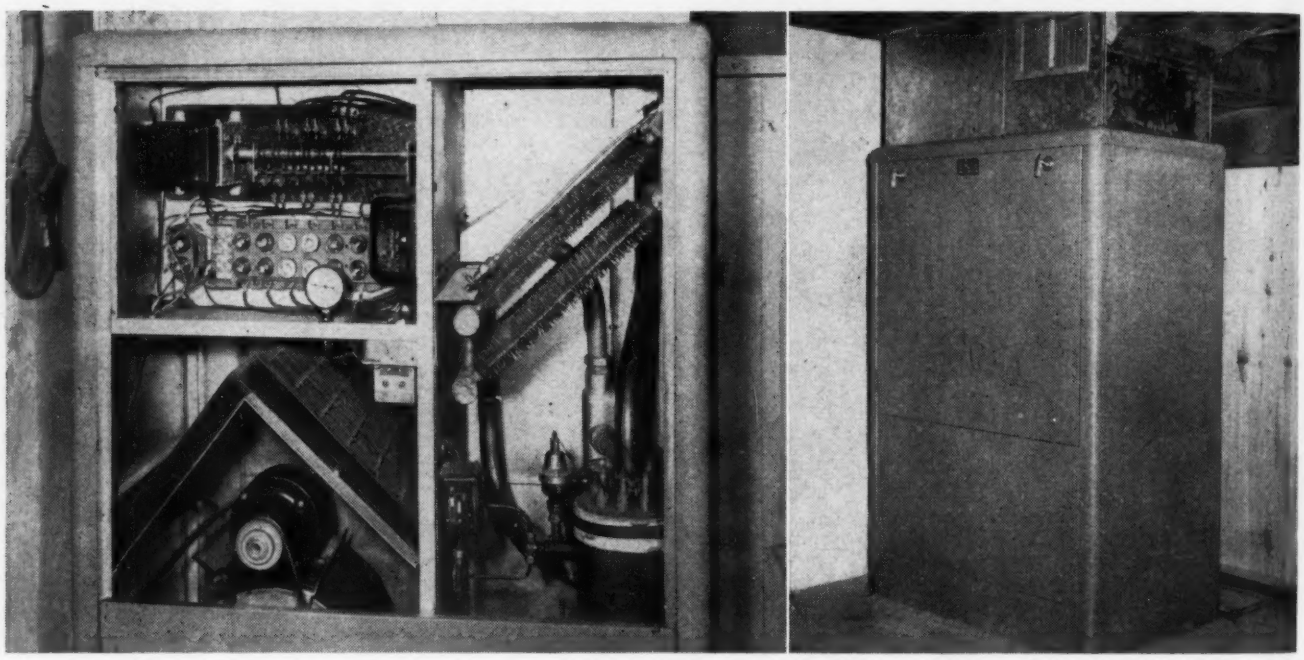
Name _____ Title _____

Company _____

Street _____ City _____ State _____

LOAD BUILDING

Steam-Electric Furnace Applied to House Heating



INTERIOR of steam-electric house heating furnace. Flash boiler with finned steam coils is shown at the right. At upper left is the modulated control, below which may be seen the blower and air filter . . . Central electric house heating furnace (right) is clean, neat and compact in this 12-kw. unit

OF THE SEVERAL means of applying electrical energy to house heating in Portland, Ore., one of the latest is the steam-electric furnace shown. This furnace, known as Vap-O-Lek and manufactured in Portland, has what might be called a flash boiler, steam from which passes through finned coils in the forced air circulating system. The furnace has the claimed advantage of not drying out the air or altering its natural humidity to any extent.

The boiler and heat transfer system are so constructed that there is practically no loss in efficiency in going through the steam cycle as against blowing air through strip heaters. The boiler is rather unique in construction. It consists of a cylindrical tank about 8 in. in diameter, into the heads of which are brazed straight 18-in. lengths of Calrod or Chromolox sheathed 1,500-watt elements with terminals on each end. These heating rods are placed inside bronze tubes which are also welded to the head plates. The boiler stands vertically in the furnace as shown in the accompanying illustration.

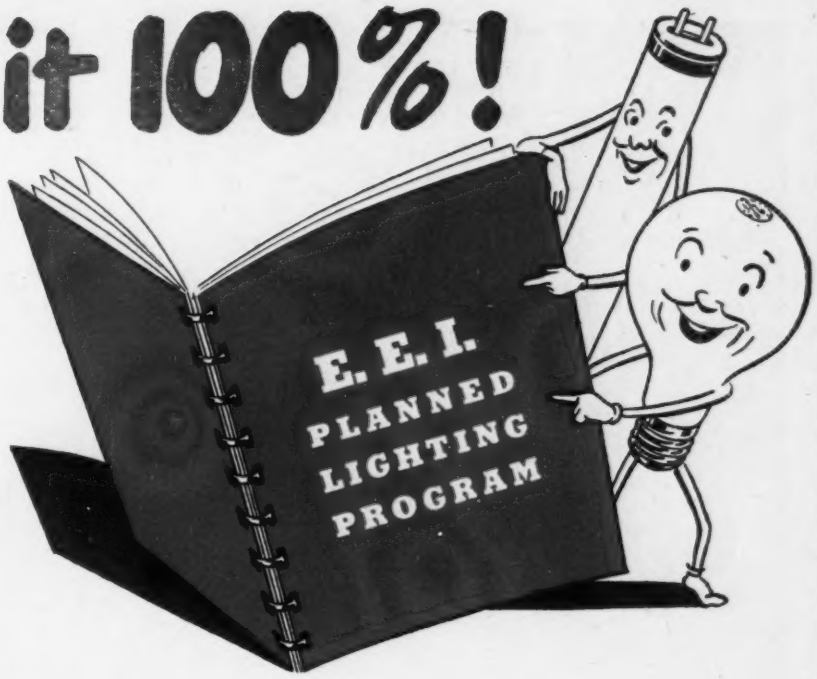
Small holes in the lower end of the enclosing tubes admit water. Due to the thin film of water between the element and the tube, the water is heated rapidly and comes out as steam through larger holes in the upper end of the tubes. About 5 in. of the upper portion of the boiler is used as a steam chest. The steam then passes through the finned bronze coils shown, where the heat is "wiped" off by passage of air in the forced air system.

For air circulation, a 9-in. silent blower driven by a ¼-hp. motor delivers 1,000 cfm. The boiler is made any capacity desired by varying the number of 1,500-watt elements used. In the installation shown the boiler contains eight elements totaling 12 kw. A feature of control is the Minneapolis-Honeywell modulated control that may be seen in one of the illustrations. This cuts heating elements in and out in steps of 1,500 watts as called for by the temperature control in the house.

The installation shown is in the residence of A. L. Redman of Portland, visited by a representative of ELECTRICAL WORLD for the purpose of obtaining the photographs. This is a six-room house containing 8,000 cu.ft. The house is insulated with rock wool in ceiling and side walls and is weatherstripped. The furnace is operated night and day on constant temperature setting to maintain 72 deg. in the house.

From November 4 to December 4, 1946, a period of 567 deg.-days, consumption for furnace, range, water heating, lights and appliances, was 3,000 kw.-hr. with a bill of $25.70. From December 4, 1946, to January

We're for it 100%!



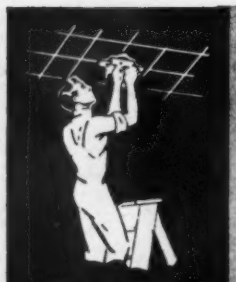
General Electric salutes the Edison Electric Institute's new comprehensive Planned Lighting program for utility companies. We believe this campaign is a logical and effective means of increasing the use of better lighting in homes, stores, schools, offices and factories — that it will benefit the entire lighting industry and every consumer it serves.

How General Electric ties in with Planned Lighting

Here are some of the ways in which the General Electric Lamp organization will support the E.E.I. program and help you increase your greatest Profit Load with Planned Lighting:

1. New developments from the General Electric Lighting Research Laboratory.
2. Cooperation of G-E lighting specialists with the educational work of the Better Light, Better Sight Bureau.
3. Expanded use of the General Electric Lighting Institute for the training of utility people and for the general stimulation of improved lighting practice.
4. Consistent nationwide lamp advertising in magazines, newspapers and spot radio.
5. Special editorial features in the Magazine of Light.
6. Up-to-the-minute engineering assistance to utility lighting departments and lighting equipment manufacturers.
7. Merchandising plans tying in G-E Lamp wholesalers, dealers and chain outlets with local utility programs.
8. Special contractor program for better lighting installations.

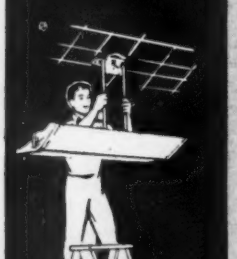
IF YOU NEED *lamp information for your Planned Lighting promotion, just call your nearby G-E Lamp office. General Electric Co., Lamp Department, Nela Park, Cleveland 12, Ohio.*



Attach hanger strap to outlet box.

Screw stems into channel.

Slip canopy over stems.



Slide stems into slots of hanger straps.

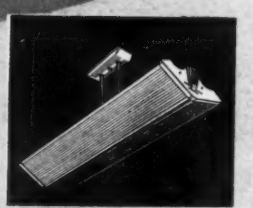
Position canopy. (The job is done.)

NEWEST SILV-A-KING FLUORESCENT FIXTURE

THE

Vanguard

for commercial installations



CAN BE SUSPENDED AS ILLUSTRATED

A quarter-century of quality engineering stands behind the new SILV-A-KING "Vanguard." Install it in offices, stores, showrooms, hospitals, and schools — to satisfy the most exacting demands!

"VANGUARD" QUALITY FEATURES:

LOUVRE Egg-crate louvre shields lamps, provides maximum diffusion.

SIDE PANELS Steel frames eliminate danger of sharp edges, add strength. Securely top-hinged to facilitate maintenance.

GLASS Frosted ribbed glass panels intensify light diffusion, remove glare.

SLOTTED END PIECES Engineered to provide soft light glow. Eliminates dark ends.

CANOPY AND STEMS (Optional) Precision fitted. Matte aluminum finish.

STANDARDS I.B.E.W., A.F. of L.; approved and listed by Underwriters Laboratories, Inc.

FINISH All metal surfaces in high-temperature, baked white enamel of high reflectivity, lasting quality.

New-Type Hanger Strap, for easy suspension installation . . . a one man job!

Hinged mechanism allows side panels to open and plumb themselves, for easy access.

Write for new "Vanguard" Bulletin!

BRIGHT LIGHT REFLECTOR COMPANY, INC.

Subsidiary of Bridgeport Pressed Steel Corp.
Fairfield at State, Bridgeport 5, Conn.

SILV-A-KING LIGHTING EQUIPMENT
SINCE 1921

6, 1947, 33 days during which there was a long cold spell with minimum of 20 deg. and with 787 deg.-days for the period, the total consumption was 3,640 kw.-hr., and bill of $31.14. Average rate for all energy used was 8.55 mills per kw.-hr., and for heating only, allowing 700 kw.-hr. for all other uses, the average rate was 8.2 mills.

The owner stated that during this latter period the greatest number of elements operating at any one time was two, or 3 kw. total. Three kw. for an hour would be 3 kw.-hr., or a heat input into the house of 10,236 Btu. This is a remarkably low hourly heat input into a house to maintain 72 deg. with outside temperature of 20 deg., and indicates an unusually well insulated house. It proves again that one of the *musts* in electric space heating is a well insulated house.

•

Restaurant Patrons Like Dielectric Cooking

SHORT ORDER COOKING speeded by radio-frequency outfit at United Farmers Restaurant in Boston

ABOUT 26 kw. in electric cooking equipment installed at the Codman Sq. store of the United Farmers Co-operative Creamery Association in Boston, with allied refrigerating equipment and lighting facilities, have brought the energy consumption of this establishment to over 2,000 kw.-hr. per month for power and 900 kw.-hr. for lighting. The cooking equipment includes a 3-kw. meat grill, 4-kw. grid-

THE KANSAS CITY LIGHT AND POWER CO. GETS AT TROUBLE FAST WITH Motorola F-M 2-WAY RADIOTELEPHONE

TOP RIGHT— H. A. Moore, Kansas City Light and Power Co. at Motorola Remote Control Console transmitting information to trouble crews.

CENTER LEFT— Line Foreman E. M. Arnold in direct communication with overhead dispatcher via Motorola Mobile Radiotelephone unit installed in his truck.

LEFT— Motorola 250 Watt Central Station installed on 20th Floor of Kansas City Light and Power Co. building. Two of these units control the company's fleet of 90 mobile units.

When line damage is reported to H. A. Moore, Chief of the Overhead System of the Kansas City Light and Power Co., he spots the trouble on a city map, relays the information into a microphone—and within *seconds* the trouble crew nearest the damage is on its way! W. E. Stevenson, Load Dispatcher for the company says that his men have come to depend upon radiotelephone as much as their cars or tools.

MOTOROLA LICKS TOUGH TERRAIN PROBLEM

Sharply undulating terrain and a high prevailing noise level make Kansas City a communications problem area. Motorola engineers specified F-M 39.66 mc. equipment —and today mobile communications are conducted up to 90 miles—with little or no weakening of the signal, and a very high signal-to-noise ratio.

INITIAL SUCCESS PROMPTS ADDITIONAL INSTALLATIONS

The Mobile Radiotelephone Units of the Kansas City Light and Power Co. have grown from an original 19 to 90—*proof* that this company is convinced that Motorola Radiotelephone PAYS OFF in fast service and in big savings of time and money!

ASK MOTOROLA ENGINEERS FOR ADVICE CONCERNING YOUR COMMUNICATIONS PROBLEM

Write today—Motorola engineers will be glad to discuss the application of Motorola Radiotelephone in your system. They'll make specific recommendations, outlining cost etc. Write today—there's no obligation, of course.

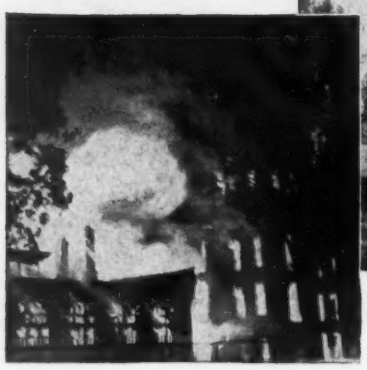
MOTOROLA INC. CHICAGO 51 COMMUNICATIONS AND ELECTRONICS DIVISION

LIGHTNING STRIKES MILL

fire follows...loss set at near $4 million

C-O-TWO detects and kills fires in early stages

A gutted tower . . . crumbling walls . . . 400 idle workers . . . months to rebuild. The cost of insufficient defense against fire.

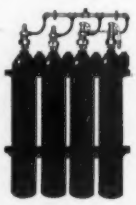


Like an atomic blast, flames leap above the doomed plant. Lightning had started it—nothing to stop it. C-O-Two immediately locates fire, signals an alarm and snuffs out the fire.

On the night of July 3, 1946, lightning struck the rear section of a building of a large textile mill. Before the fire department arrived, the whole structure was in flames. Despite later assistance of three fire departments from neighboring towns, flames spread and destroyed two plants and several warehouses. The next morning showed a total loss of $3,800,000. Cause: inoperative and inadequate protection.

The C-O-Two Industrial Smoke Detecting and Fire Extinguishing System protects your plant 24 hours a day. The slightest thread of smoke in any protected space sets off an alarm and floods the space with a dry, sub-zero, heavier-than-air cloud of carbon dioxide gas. It sweeps around obstructions, penetrates narrow spaces and snuffs out every trace of fire. Machines, materials, records and electric apparatus are not harmed. Non-conducting, C-O-Two is safe to use on running electric motors and live wires.

Where smoke is present in normal operation, heat-actuated devices set off alarms and discharge carbon dioxide when the temperature rises to a pre-determined point. C-O-Two is available in a size for every risk — famous Squeez-Grip portables, wheeled and hose reel units and complete automatic systems. Write us for more information on safe, modern C-O-Two fire protection.



C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

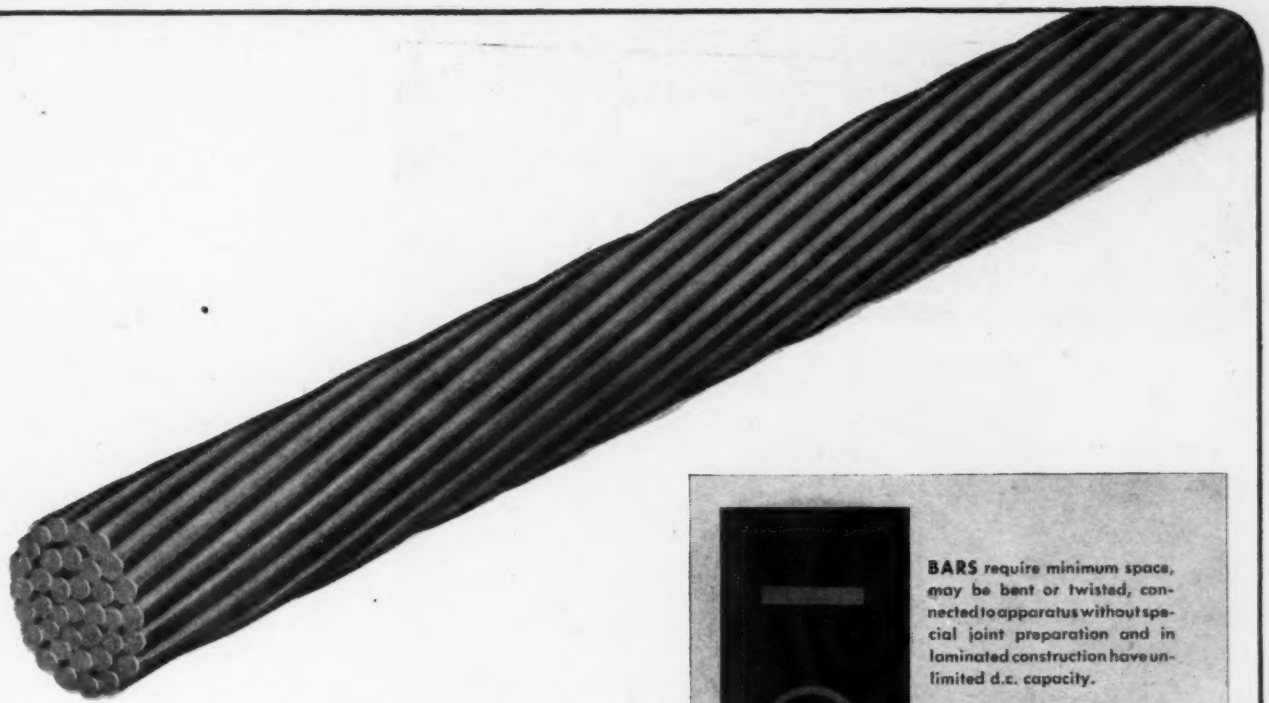
dle, two 2.5-kw. 4-slice toasters, a 4-kw. electrically heated steam table, and a newly installed 4-kw. broiler pioneering in the use of "Globar" heating units (Raytheon) and a 1,200-watt McGraw warmer, plus a 5¼-kw. "Radarange" recently developed by the Raytheon Mfg. Co.

Pioneer Application

The last-named equipment was installed on a rental basis of $5 per day, including servicing and replacements, and is a pioneer application of radio frequency cooking, being one of a very few put in service on a commercial basis in the Boston area. The "Radarange" employs a Raytheon magnetron whose energy output is directed to a horn or applicator which beams directly into the food to be cooked. As these (heat) waves of energy are reflected by all metal objects and transmitted by glass objects, cooking is done in low-loss tempered glassware permitting full penetration of the waves from all directions. The microwaves from the tube penetrate deeply into the food, cooking the center as fast as the outside. The magnetron oscillator requires a minimum flow of cooling water of 2 qt. per min., with valve control synchronized with the main on-off switch, which is automatic in operation after the unit is set for a predetermined time cycle of cooking. Energy is supplied at 230 volts, 60 cycles, and 30 amp. maximum.

Energy Consumption Minor

At the Dorchester store the high speed of cooking and consequent short periods of application of energy to the electronic range have made the energy consumption of relatively minor importance. A frankfurter is cooked in about 11 sec., corresponding to about 1/50 kw.-hr. A steak plate with vegetables is cooked in 50 sec., calling for less than 1/10 kw.-hr. Possibly 500 watts may be consumed steadily by the tube filament when the unit is on the line during business hours; but this would not cost over, say, 1.5 to 2 cents per hour. The ability of the restaurant to serve three times as many customers per day through speeding up the cooking process makes the energy cost of little consequence in proportion to the increased sales volume obtained. This method of cooking has the advantage further of being extremely



BARS require minimum space, may be bent or twisted, connected to apparatus without special joint preparation and in laminated construction have unlimited d.c. capacity.

TUBES provide the highest bus conductor efficiency at a.c. frequencies, have greater rigidity, and may be oil or water cooled.

CHANNELS have large surface area, reduce temperature rise, provide greater rigidity than tubes for long runs and have flat surfaces for tap-off.

ANGLES for ventilated hollow busses have highest rate of heat dissipation, handle greater current density, but require more space for installation.

CABLES solve many problems in conducting extremely heavy currents in confined space or in connecting moving apparatus such as furnaces of the arc or resistance types.

Copper Cables

. . . for heavy currents and flexibility in confined space

A BUS of cable connections is sometimes more convenient than the more rigid conductor shapes. One example is where extremely heavy currents are required in a confined area.

Flexibility is another advantage offered by cable conductors. They are used for this reason in connecting the main bus run to the electrodes of arc furnaces and resistance furnaces of high capacity.

Anaconda Bus Conductors are made in this and the four other standard shapes illustrated. Each is produced in a wide range of capacities, and all are made of *copper* . . . the bus conductor material that combines low electrical resistance, high thermal conductivity and high corrosion resistance with adequate strength. For detailed information, write for Anaconda Publication C-25. 4T100

ANACONDA
from mine to consumer

Anaconda

BUS CONDUCTORS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

Improved Protection Against Overtravel with new Weight-Operated Limit Stop

No. 10-W Youngstown size; 40 H.P.; 230 volts; d.c. maximum rating.

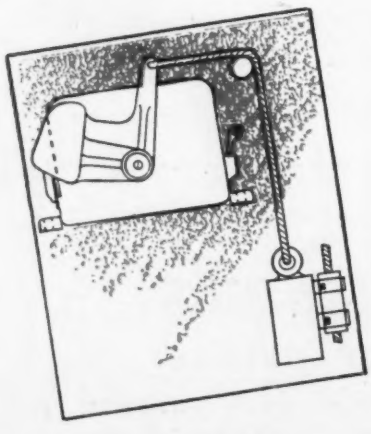
Now, a *weight-operated* Safety Limit Stop for the smaller horsepower crane-hoists. Tripped by *weighted* operating-lever when the danger zone is reached . . . reset *automatically* by suspended *weight* when controller is reversed to lower the hook-block. Other advantages are:

1 No lubrication required—Oilite bearings are self-lubricating and long-lived. This means that the costly and sometimes forgotten item of lubrication-maintenance is eliminated forever.

2 Compact—easy to mount—Small, over-all dimensions—four convenient mounting holes—one suspended weight.

3 Small reset travel—High crane lifts are possible with this new No. 10-W because the amount of travel between "run" and "tripped" positions has been kept at a minimum.

4 High interrupting capacity—Two normally open and two normally closed contacts, mechanically interlocked and with wide, vertical opening, always assure positive interruption of the hoist motor current.



Send for Bulletin 1032 which gives complete details for applying Youngstown Safety Limit Stops to both new and old cranes, either a.c. or d.c.

Optional Style—with offset weighted-arm which eliminates intermediate sheaves when Stop is not mounted directly over crane hook-block. Available on all sizes of EC&M Youngstown Limit Stops.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

clean, minimizing food handling, doing away with pungent and sometimes nauseating grease smoke, burned black cooking utensils and corroded grill plates. Completely frozen dinners may be thawed and served piping hot in 2 minutes. A rapid extension of this type of cooking is developing in this area as a result of experience with the initial installations.

•

Better Street Lighting Costs Less per Unit

To GET a lot more by spending a little more is an idea that works perfectly in street lighting, according to A. F. Dickerson, manager, lighting division, General Electric Co., in a recent talk to the Southeastern Electric Exchange. Mr. Dickerson showed the following comparative figures of the street lighting modernization program of Kansas City, Mo., developed and being carried out by the Kansas City Power & Light Co.:

	Old	*New*
Number of Lights	15,000	13,500
Total Effective Lumens	11,500,000	49,000,000
Yearly Cost	$552,000	$722,000
Cost per 1,000 Effective Lumens	$47.53	$14.75

All new lighting in Kansas City is planned to equal or exceed I.E.S. Code requirements. There will be no lamps below 4,000 lumens. From this tabulation it is evident that the public is getting an excellent deal as they will get traffic safety lighting at less than a third the present cost per unit of effective light. At the same time the utility will receive a 30 percent increase in revenue and much good will.

"Gently, Joe, gently—that last lick almost did it"

Light . . . THE WAY TO MODERNIZATION

"Something Better Has Come to Light" in distinctively styled, efficiently engineered lighting.

Practically, technically and creatively—standard Fluorescent and Incandescent Pittsburgh Permaflector Lighting Equipment can produce "custom designed results" in all types of interiors and exteriors.

A PERMAFLECTOR PORTRAIT
The Kleinhans Co.
Buffalo, N. Y.

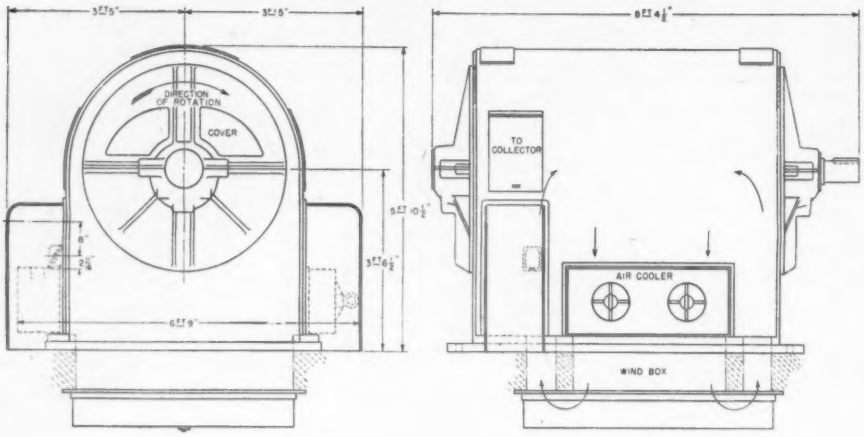
USE PITTSBURGH PERMAFLECTOR LIGHTING EQUIPMENT

PITTSBURGH REFLECTOR COMPANY
OLIVER BUILDING · PITTSBURGH 22, PA.

MANUFACTURERS OF FLUORESCENT AND INCANDESCENT LIGHTING EQUIPMENT
DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

NEW EQUIPMENT

Large Motors Have Unusual Surface Cooler Arrangement



SEVEN large, totally enclosed, wound-rotor induction motors now being built by the General Electric Co. for driving boiler feed pumps through speed-increasing gears are stated to have an unusual arrangement of surface coolers which combines simplicity and utility with attractive appearance.

The fabricated-steel stator frame of each motor is extended sufficiently below the stator laminations to permit the surface air cooler to be mounted directly under them, crosswise of the shaft, within the stator frame, and above the sole plate.

The water box at each end of the surface air cooler protrudes from the side of the steel frame. Water-box cover plates can be removed for cleaning the cooler tubes without distrubing the piping.

Inlet and outlet flanges are located at the top of one water box. Pipes leaving the connections will be carried through shut-off valves, making a U-bend into the floor at each side of the water box. This arrangement will permit withdrawing the entire cooler horizontally toward the connection end after the flanges are unbolted.

The base plate is provided with a rectangular air discharge opening immediately below the cooler and with a rectangular air inlet opening toward each end of the motor. The user will provide three corresponding openings through the station floor. A sub-floor wind box supplied with each motor and covering the three floor openings will be bolted to the ceiling of the floor below.

Special fabricated conduit boxes extend to floor level, one on each side at the collector end. One box accommodates primary cables, while the other handles secondary cables.

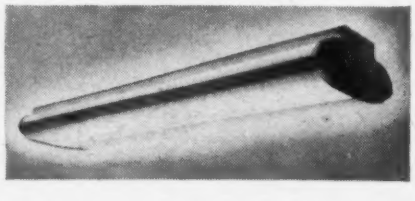
Large stator-frame openings above each conduit box, together with top-half end-shield openings, provide access to the collector assembly. These openings are provided with removable cover plates. Lifting lugs are recessed in the top at the stator frame and concealed by neat cover plates.

For this installation, the placing of the cooler beneath the stator laminations but above the floor line will result in just the right height of shaft for connection to the input shaft of the speed-increasing gear, it is reported.

•

Fully Enclosed Commercial Fluorescent Unit Developed

A NEW surface-attached, fully enclosed fluorescent unit has been developed by Holophane Co., Inc., 342 Madison Ave., New York, 17, N. Y. Designed for use in offices, drafting rooms, libraries, schools, etc., the unit is equipped with a new curved-tube Controlens which, the manufacturer reports, collects the light from the lamp and bends it downward in an intensive pattern to provide the maximum illumination over useful areas.



The bending action is stated to eliminate glare at normal viewing angles. Shadows are softened and brightness contrast reduced by the upper refracting section of the unit, it is stated.

Designed to take either two or three lamps, they may be installed as single fixtures or ganged together in extended lengths. They may be mounted directly on the ceiling or suspended on stems to overcome ceiling height or obstruction difficulties.

•

Water Pumping Unit Usable On Shallow or Deep Wells

A NEW water pumping unit, which is stated to simplify water system sales, has been announced by Goulds Pumps, Inc., Seneca Falls, N. Y. It is stated to eliminate the dealers' chore of determining the type, capacity and pressure specifications to do the job.

The new unit is a "packaged water system" called "Jet-O-Matic," and is interchangeable for either shallow or deep well services. It is built in two series. Series "M" medium pressure pumps provide capacities up to 2,100 gal. per hour for shallow well service at normal water pressure, with deep well ratings for medium well depths. Series "H" high pressure pumps provide

LIGHTING IS CONTAGIOUS

The per capita use of light has increased 780 per cent since 1915. The rate of increase has accelerated rapidly since 1938—a natural result of the growing public acceptance of the benefits of better lighting.

The accompanying chart shows the growth of lighting load compared with the growth of U. S. population and wired homes.

In 1915 the total of electric energy consumed for lighting averaged 50 kwh per person. In 1946 this average had increased to 446 kwh—an increase of 780 per cent!

Why has such an amazing increase in the use of light taken place? Because people are becoming ever more conscious of the comfort, efficiency, and pleasure provided by proper light.

PROMOTION HELPS SELL LIGHT

This consciousness has grown because of the promotion of lighting by utilities and manufacturers and because, once tried even on a small scale, good lighting proves itself.

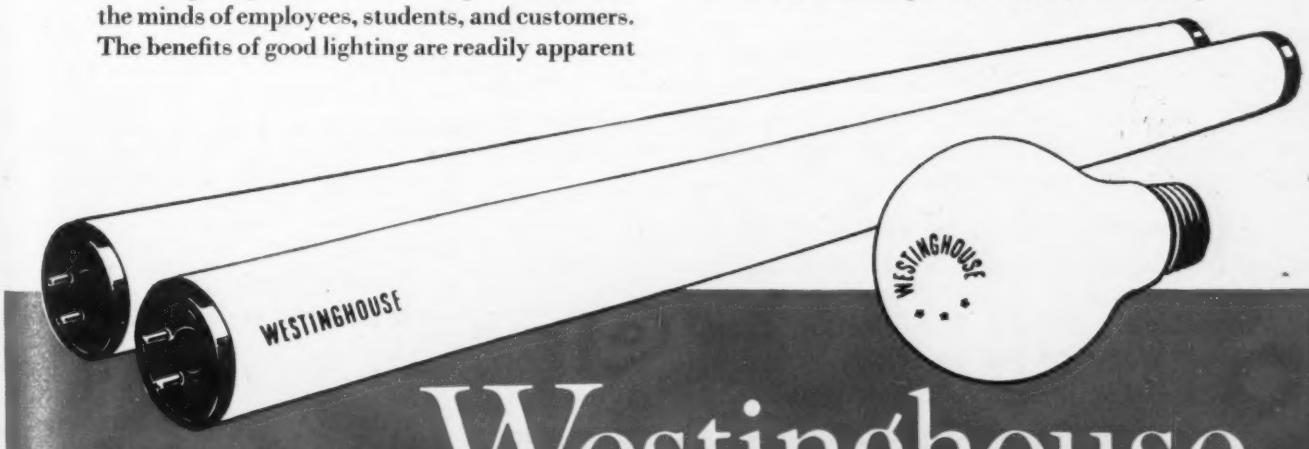
Good lighting is contagious. When See-ability is increased in one plant, school, store or office, it is not long before the desire for better lighting spreads to other plants, schools, stores, and offices in the same locality. Similarly, the desire for better lighting in the home is implanted, too, in the minds of employees, students, and customers. The benefits of good lighting are readily apparent and the demand for greater See-ability spreads naturally and rapidly.

Every evidence points to the continuing growth of lighting. The average footcandle level of illumination is less than one fourth of the practical and economic level used as a standard for good lighting practice today.

MORE LIGHT IN LARGER AREAS FOR MORE HOURS

But the real growth of lighting cannot be estimated by speaking in terms of just that one dimension, footcandles. Lighting will spread in three dimensions: higher footcandle levels will be used, they will be used in larger areas, and they will be used for more hours.

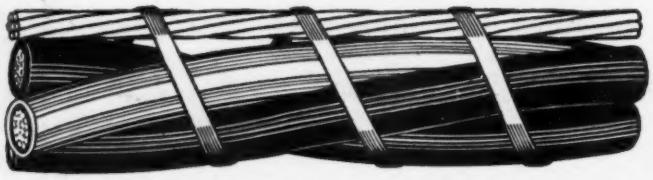
Now is the time to prepare for the all-out promotion and selling program that will take advantage of the potential lighting market as supplies of equipment permit. Now is the time to be training sales personnel, to pre-sell the market, and to organize the sales campaigns that are the final pay-off. Lamp Division, Westinghouse Electric Corp., Bloomfield, New Jersey.



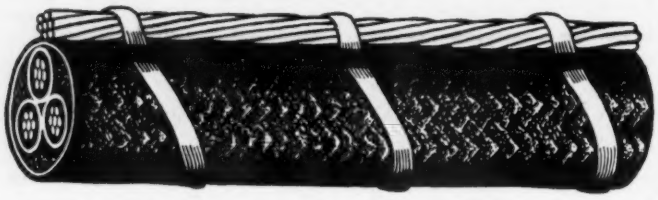
Westinghouse

LAMPS FOR SEE-ABILITY

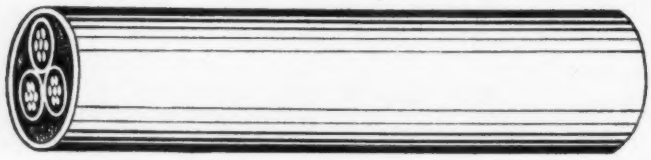
Simplex Aerial Cables



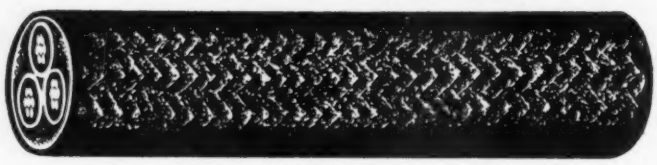
ANHYDROPRENE Type - Self-Supporting.



Braided Type - Self-Supporting.



Lead Covered Type.



Braided Type.

No matter what your needs may be in aerial cable — whether they are cables for power or control — Simplex makes a type and a style that will fit the conditions in your area.

Four general types are shown above. Two are self-supporting and two are for use in the conventional manner with messenger wire. Each individual style is particularly suited for use where special conditions require special constructions.

Simplex engineers will be glad to work with you and give you the benefit of their many years' experience in designing aerial cable systems. If you have an aerial cable problem, or are considering extending an aerial cable line, why not get in touch today with the Simplex engineer? He will be more than glad to help you.

Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO. 79 SIDNEY ST. CAMBRIDGE 39, MASS.

high pressure shallow well service and a range of deep well ratings up to 1,270 gal. per hour. It is of close-couple construction and a mechanical seal eliminates the stuffing box.

•

System Maps Stored In Fire-Resistant Case

A NEW CASE for storing system maps and charts has been developed by General Products, 40 Engle St., Englewood,

N. J. The unit will accommodate 72 in. in width and 250 linear ft. in length. It is stated to make possible the storage of a large number of maps in a limited space, the quick selection and display of a specific map, and the preservation of the maps and charts in a fire-resistant steel enclosure.

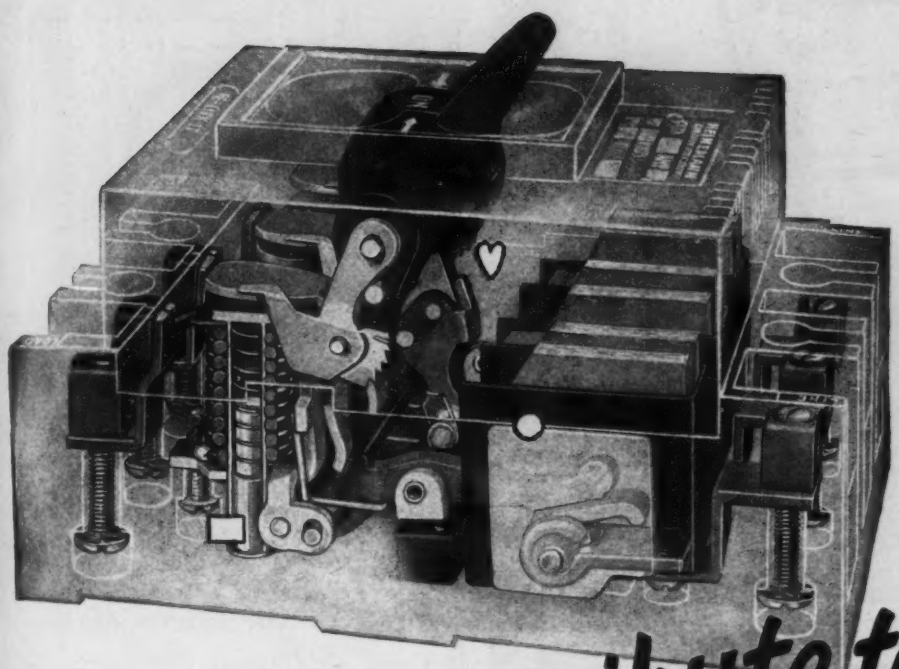
The case is equipped with three electric motors and with internal reduction gears to operate the maps forward or in reverse and to operate an inbuilt horizontal shelf. The unit is lighted on the map surface by special inbuilt reflectors which house fluorescent tubes. The units are made in 8, 10, 12, 14 and 16-ft. widths. Deliveries are stated to be possible within 90 to 120 days.

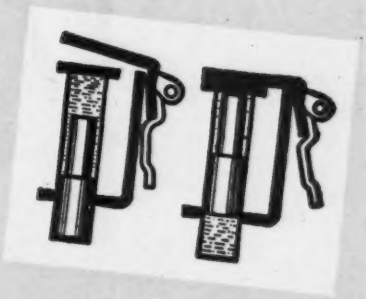
•

"Wire-Hiway Base" Hides Wiring in Room Baseboard

A "WIRE-HIWAY BASE" providing wiring facilities as well as partition anchor and trim is being introduced by Charles E. Barnes & Son, 4320 Osage St., Philadelphia 4, Pa. The base is made of satin finished extruded aluminum which can be painted if desired.

It is 3½ in. high and coved top and bottom. The front panel is removable by lifting ½ in. and thereby exposing the





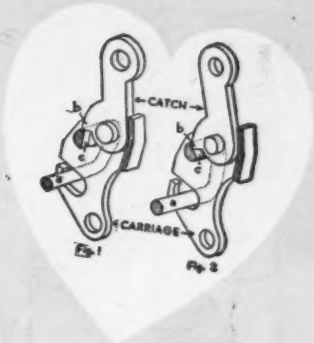
TIME DELAY ON OVERLOADS

The magnet coil surrounds a hermetically sealed liquid filled cylinder containing an iron plunger which while normally out of the magnetic field moves into it on overloads, the liquid controlling its speed. As the plunger rises to the top of the cylinder, the magnetic flux increases to its maximum. At this point the armature is attracted and operates the latch.

All 3 contribute to the High Efficiency of

EST. HECO 1888

HEINEMANN MAGNETIC CIRCUIT BREAKERS



HIGH SPEED LATCH

The armature, on engaging the lower leg of the lock (a) rotates it so that the tooth of the catch (b) passes through the cut portion of the lock (c) and opens the contacts. Of all known latches this one acts with the least amount of friction and mechanical delay. The latch collapses only on short circuit or overload conditions even if the handle is purposely held in the "on" position.

They employ an overload trip unit that is FULLY ELECTRO-MAGNETIC and have definite and instantaneous trip points independent of their time delay characteristics. The current carrying capacity as well as the minimum and instantaneous trip points are not affected by ambient temperatures. A true inverse time delay in the hermetically sealed unit allows the passage of inrush current. However, continued overload opens the breaker in time inverse to the ratio of current.

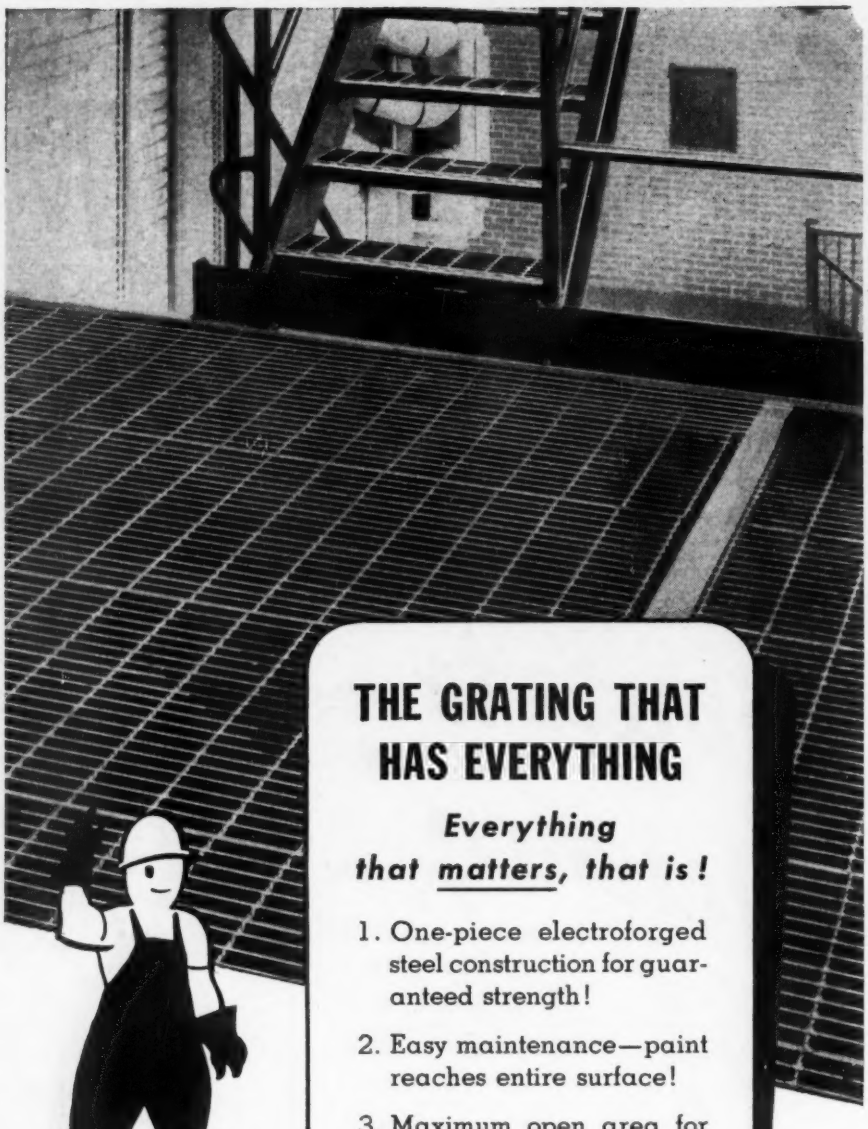
HIGH SPEED BLOWOUT

The stationary contact is coiled around an insulated iron core connecting steel plates to form a U-shaped magnet. On overloads and short circuits, the current flowing through the contact creates magnetic lines which force the arc into the arcing chamber and blow it out. As the value of the current to be interrupted increases, the quenching effect becomes greater due to intensified magnetic field.

HEINEMANN ELECTRIC COMPANY

Established 1888

103 PLUM STREET TRENTON, N. J.



THE GRATING THAT HAS EVERYTHING

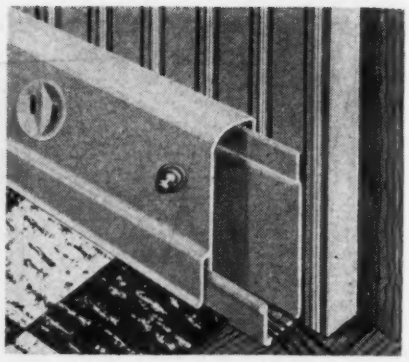
Everything that matters, that is!

1. One-piece electroforged steel construction for guaranteed strength!
2. Easy maintenance—paint reaches entire surface!
3. Maximum open area for light and air!
4. Self-cleaning—no sharp corners to clog with dirt!
5. Economical and easy to install—wherever and whatever your grating needs!

FREE . . . So that you can have a "close-up" of Blaw-Knox Grating construction, write today for this "paperweight-size sample" on your business letterhead.

BLAW-KNOX DIVISION
of Blaw-Knox Company
2013 Farmers Bank Bldg., Pittsburgh 22, Pa.

BLAW-KNOX ELECTROFORGED STEEL **GRATING**



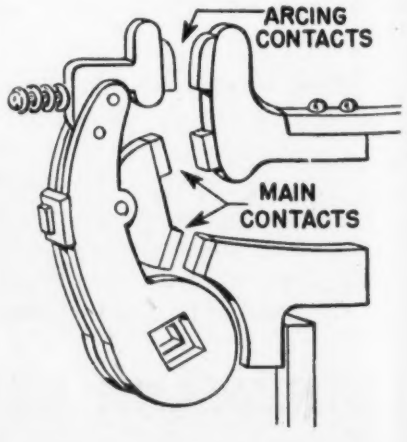
wiring. Outlets can be provided wherever needed and added as desired. Foot operated switches may be incorporated as illustrated. Four screws in the rear member are said to erect up to 10 ft. of the "Wire Hiway."

•

Silver-Molybdenum Contacts Used on Circuit Breakers

SILVER-MOLYBDENUM electrical contacts possessing high arc resisting characteristics are reported to have been developed by Gibson Electric Co., 8351 Frankstown Ave., Pittsburgh 21, Pa. At present, the new contact material is supplied in two grades: M-10 and M-12, the latter containing a higher percentage of molybdenum. Because of its higher refractory content, M-12 is used on heavy circuit breakers where greater mechanical and electrical stresses are encountered. M-10 is used on smaller size circuit breakers handling lower pressures. The silver-molybdenum electrical contacts are suitable for use as arcing tips in either air circuit breakers or oil circuit breakers, also as contacts in other oil immersed apparatus such as transformer tap changers, the manufacturer reports.

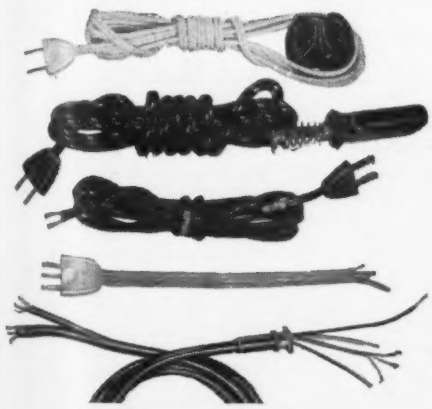
Made by the powder metallurgy process, the contacts are reported to combine high hardness with good conductivity. M-10 has a hardness of 75 Rockwell B with 50 percent of the conductivity of pure silver, and M-12



PLASTICON

10 WAYS BETTER

1. Greater dielectric strength.
2. Cannot fray, crack or rot.
3. Low moisture absorption.
4. Greater mechanical strength.
5. Higher abrasion resistance.
6. Flexibility at all temperatures.
7. High chemical resistance.
8. Wide range of permanent gem-like colors.
9. Non-combustible.
10. Lasting appearance.



CORD SETS FOR EVERY PURPOSE

DECIDE FOR YOURSELF!

Our booklet of technical data is packed with facts about the mechanical and dielectric characteristics, resistance to chemicals, aging properties, and other important data of interest and importance to all users of wire and cable. Write for your free copy today, or explain your requirements and let us tell you how PLASTICON can meet them. Plastic Wire & Cable Corporation, 407 East Main Street, Jewett City, Connecticut.

KLEINS

...FOR THE MAN ON THE POLE

On emergency jobs . . . on tough jobs . . . on routine jobs . . . the men who string and maintain the nation's power and communication lines rely on Kleins. Wherever you see linemen you'll see Kleins—pliers and wrenches, tool belts and safety straps, climbers and grips.

There's a sound reason for this preference. For linemen and electricians—men who know good tools—also know of the quality materials and expert craftsmanship that go into every piece of Klein equipment. To them this excellence means safety, efficiency, speed . . . on every job.

Today Klein is in production on its complete line of quality equipment. Of course, demand still exceeds supply—but your supplier will furnish the Klein equipment you need just as soon as possible.

Klein Pliers

Klein-Kord Tool Belts

Klein-Kord Safety Straps

Klein Climbers

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York

The Klein Pocket Tool Guide showing the Klein line and containing useful information will be sent on request.

Since 1857

Mathias KLEIN & Sons

Established 1857 — **Chicago, Ill., U.S.A.**

3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

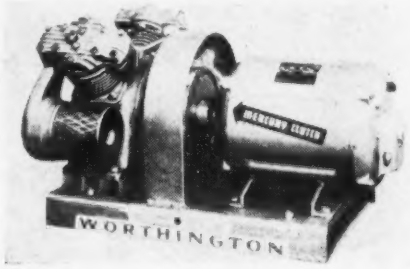
has a hardness of 85 Rockwell B with 45 percent conductivity.

The contacts are made in individually molded shapes for each application, thereby eliminating machining operations and conserving material. They are furnished solder backed.

•

Mercury Clutch Decreases Motor Inrush Current

A MERCURY-ACTUATED clutch developed by Mercury Clutch Corp., Canton, Ohio, makes possible automatic



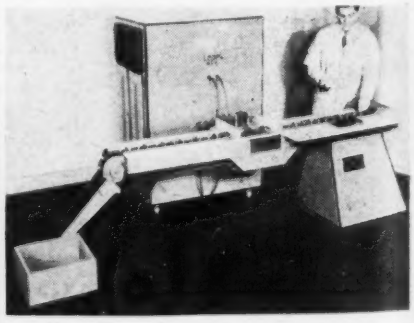
starting of air compressors. The clutch permits the driving motor to attain full speed before the compressor turns, eliminating the need for pressure release valves. The clutch incorporates a "time delay" factor which retards the engagement for a second or more, to permit the motor to come up to full speed before any load is applied.

Mercury (Quicksilver) is used as the control medium because of its high specific gravity. Centrifugal force acting on a small amount of mercury produces hydraulic pressure which is dependent upon the "head" of mercury and which is applied directly to the friction shoes. The manufacturer has developed standard clutches for all types of electric motors up to 15 hp. and for internal combustion engines.

•

Conveyor-Belt Table Used in HF. Applications

A NEW conveyor-belt table for use in conjunction with induction heaters has been developed by Lepel High Frequency Laboratories, Inc., New York City. It was designed to facilitate han-



5 for 4

A New Addition to GENERAL'S Line of CD-SnoFoe Carbon Dioxide Extinguishers

GENERAL'S new 5-lb. CD-SnoFoe carbon dioxide extinguisher costs no more than the 4-lb. size—yet gives you 25% more fire protection. This makes GENERAL CD-SnoFoe the best buy in the fire extinguisher market—best for protection; best for economy.

The new 5-lb. GENERAL CD-SnoFoe fits the standard 4-lb. wall bracket. Improved design of the shell makes it unusually light and easy to handle, with no sacrifice of structural strength.

IF IT'S GENERAL IT'S DEPENDABLE

New 2½-lb. Size, Also!

Another new CD-SnoFoe—2½-lb. size—gives 25% more fire protection than the 2-lb. size, yet costs the same. It is light, strong, and easy to handle, due to improved shell design—an outstanding value. See the yellow section of your local telephone directory for your nearest GENERAL dealer. Ask him to show you both these new CD-SnoFoe extinguishers, or write for complete details.

Service For You . . .

Through GENERAL'S Distribution System

To assure you immediate service, GENERAL maintains a nation-wide network of 20 branch offices and warehouses. There is one near you. Call your local GENERAL representative for advice and counsel on all your fire protection needs, or write direct.

THE GENERAL DETROIT CORP.

Manufacturers of Fire Extinguishers
Motor Fire Apparatus and Allied Equipment

2270 E. JEFFERSON • DETROIT 7, MICHIGAN

NEW YORK • PHILADELPHIA • ATLANTA • CHICAGO • DALLAS

West Coast Subsidiary: The General Pacific Corp.

Los Angeles San Francisco Denver Seattle

Distributors in Principal Cities

2 NEW SHALLCROSS LOW-RESISTANCE TEST SETS

(Bond Testers)

670C ▸
◂668

Linear Micro-Ohmmeter Models

These new Shallcross instruments permit quick, accurate comparison tests of extremely low resistances between 2 and 800,000 micro-ohms. They are ideally suited for testing electrical bonds, heavy current switch and relay contacts, resistivity of heavy conductors or for making low resistance measurements. Both instruments utilize the 4-terminal method of measurement, thereby minimizing lead and contact resistance.

Type 670-C, a six-range instrument (1,000 to 500,000 micro-ohms) is designed for outdoor or production line work where extreme portability is needed. It weighs only 10 lbs., operates from dry cells. Housed in steel case fitted with carrying strap.

Type No. 668 has eight ranges (200 to 800,000 micro-ohms), weighs 30 lbs. and operates from 115v 60-cycle current. It is the perfect instrument for all research, laboratory or production low-resistance tests.

WRITE FOR BULLETIN LRT-1

describing the complete line of Shallcross Low-Resistance Test Sets.

SHALLCROSS MFG. CO., Dept. EW-57 Collingdale, Pa.

SHALLCROSS

Write for Bulletins on any of these products:

- Accurate Heavy-Duty Power Resistors
- Attenuation Pads
- Attenuators — Fixed and Variable
- Ayrton Universal Shunts
- Bridges, Resistors, Decades, etc.
- DC Instrument Power Supply
- Decibel Meters
- Fault Location Bridges
- FM and Television Sound Components
- H. V. Corona-Protected Resistors
- Kelvin-Wheatstone Bridges
- Kilovoltmeters and K. V. Multipliers
- Logarithmic Decade Boxes
- Low Resistance Test Sets
- Megohm Bridges
- Percent Limit Bridges
- Portable Galvanometers
- Potentiometers — step and slide-wire
- Precision Wire-wound Resistors
- Ratio Arm Boxes
- Rotary Selector Switches
- Standards—Resistance and Decade Boxes
- Telephone Transmission Test Equipment
- Unmounted Resistance Decades
- Voltage Dividers
- Wheatstone Bridges
- Wire-wound Surge Resistors

dling of work parts in brazing, soldering, annealing, hardening, etc.

The conveyor belt is powered by a ¼-hp. motor, and the belt speed may be regulated to accommodate a variety of applications. The conveyor belt proper permits the fastening of interchangeable supports to hold various shaped work parts in place. The load coil is movable along the table.

•

D. C. Timing Motor Has Non-Magnetic Rotor

A REVERSIBLE variable speed timing motor that operates on direct current has been announced by A. W. Haydon

Co., 111 West Main St., Waterbury 2, Conn. The motor rotor, which has a seven-coil, low reactance winding and seven segments in the commutator, is made entirely of non-magnetic materials. The motor starts at a low initial voltage and its speed is said to be variable over a wide range, from 1,800 rpm. to two revolutions per hour.

The unit is completely encased by a welded housing and is said to have lifetime sealed-in lubrication. It has a current consumption under 100 milliamperes and may be operated from a small amplifier tube or a flashlight battery for remote electronic control. It is said to have a life expectancy of 5,000 hours.

•

New Hot Line Clamp Made in Three Types

A NEW hot line clamp has been introduced by W. N. Matthews Corp., 3722 Forest Park Ave., St. Louis 8, Mo. It utilizes a split lock nut which is stated to keep the clamp from vibrating loose and a self-lubricating feature which is stated to eliminate thread corrosion.

The clamp can be installed or removed with any standard hook or socket-type hot stick. The duck bill of

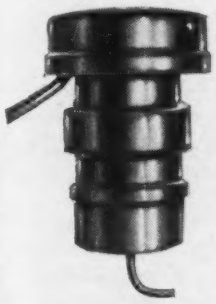
YOUR CHOICE OF 2 ARRESTERS FOR COMPLETE LIGHTNING PROTECTION

Westinghouse Type LV Autovalve and Type A "De-ion" Lightning Arresters are designed to "take it" —and provide for your system maximum protection against *all* lightning hazards. Microsecond recordings of many actual lightning discharges, plus thousands of tests with man-made lightning, supplied data for the development of Types LV and A Arresters.

Either arrester will protect equipment, reduce fuse outages, provide adequate capacity for handling both "hot" and "cold" lightning and afford extra service-free arrester life. With the development of Type LV Autovalve and Type A "De-ion" Arresters you now have your choice of specialized arrester characteristics to meet specific requirements—whatever they may be.

For added information on Westinghouse Lightning Arresters and where to apply them, call your Westinghouse distributor or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60574



Type LV Autovalve Arrester

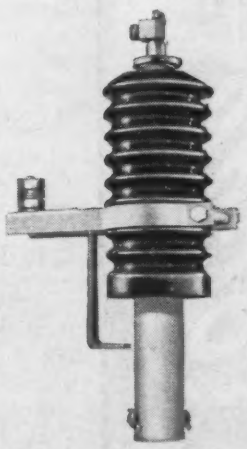
(3 to 15 kv incl.)

Isolating gap holds off rated voltage when not discharging lightning surge.

Pre-ionizing tips assure low, uniform impulse gap breakdown.

Pre-formed and pre-tested Autovalve block assures unchanging characteristics.

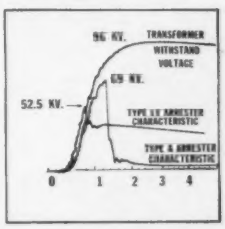
Assembled and sealed in dust and moisture-free room, and pressure-tested to assure exclusion of moisture in service.



Type A "De-ion" Arrester

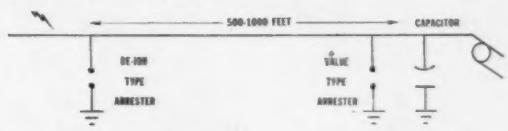
(6 to 15 kv incl.)

- Electrostatic shielding provides consistently low sparkover
- IR drop limited to arc voltage
- Loose fibre filler increases life by distributing discharges
- Mechanically spaced air gap prevents line lockout
- High thermal capacity helps handle "hot" lightning



Both Type LV and A Arresters protect—limit voltage to a value well below the apparatus impulse strength. In 95% of applications either gives needed protection.

For certain applications, each has particular advantages. Rotating machines, for example, are best protected by the use of both types of arresters. The valve type at the machine because of its lower sparkover, and gradual decay of discharge voltage; "De-ion" type on the line to drain lightning energy quickly off the system.



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Lightning Arresters

LOOK TO LOCKE FOR DISTRIBUTION MATERIALS

Clevises and Spools, for example

This is No. 0342 clevis with No. 355 wet process porcelain spool—from a complete line of Locke clevises and spools which are designed together and made together to work together.

The clevis is designed and made to receive all 3-inch spools—thus simplifying your stocking problem. A 5/8-inch bolt can be inserted in the slotted mounting hole even with the spool in place.

The steel clevis is formed from heavy stock—providing a high factor of safety for maximum working loads. And, of course, with *Permazinc* — Locke's *Quality Controlled* double hot-dip galvanizing—for extra years of dependable service.

The spool is of wet process porcelain for best electrical characteristics, with *Compression Glaze*—originated by Locke—to provide highest strength.

Depend on Locke for *Quality Controlled* distribution materials—pole line hardware and insulators. *One* order covers *both*.

Locke

POLE LINE HARDWARE *and* INSULATORS

LOCKE INSULATOR CORPORATION • BALTIMORE 3, MARYLAND

the hook facilitates guiding the clamp on the main line wire. The clamp is made in three types. The all-purpose clamp used for the connection of wires of like or unlike metals is made of a plated cast bronze. The cast aluminum clamp is used for aluminum to aluminum or aluminum to copper connections. The cast bronze clamp is used for copper to copper connections.

•

Capacitors Developed For Television Sets

NEW TYPE TMC series high-voltage capacitors for use in television equipment have been developed by Cornell-

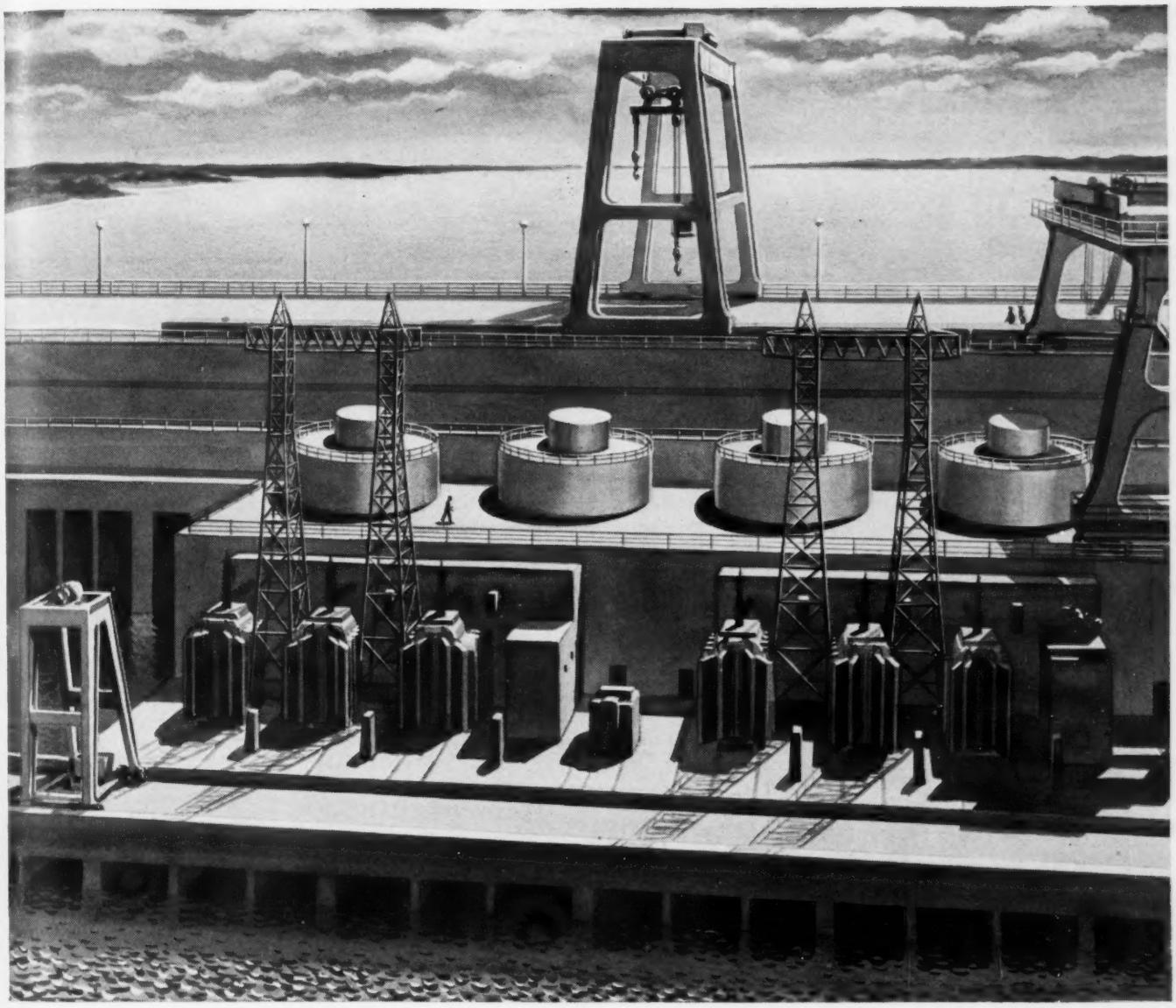
Dubilier Electric Corp., South Plainfield, N. J. They are available in capacities ranging from 0.005 to 0.05 mfd., and d.c. voltage ratings from 2,000 to 5,000.

The capacitors are housed in tubular, hermetically sealed containers of seamless drawn metal tubing and are impregnated and filled with Dypanol. The units are self-supporting since one lead is brought out from each end.

•

Motorized Valves Usable on 24, 110, or 220-Volt Circuit

A MOTORIZED valve adaptable to commercial machinery and equipment, heating and air-conditioning systems, heating and cooling coils, etc., is being placed in production by Automatic Temperature Control Co., 34 East Logan St., Philadelphia 44, Pa. Designed for



A Type for Every Need . . . A Size for Every Job

BALDWIN HYDRAULIC TURBINES

When your planning on new hydro developments reaches the turbine stage—that's when Baldwin can help.

This Baldwin line of turbines gives you a type and size for every head and every need . . . each backed by records of performance in some of the world's largest installations.

Baldwin *Propeller* Type Turbines permit economical development of uniform heads of 100 feet or less. (One noteworthy installation is in Brazil. Runner diameter, 135"; H.P. 14,200.)

Baldwin *Kaplan* Turbines provide peak output with varying heads. (Five of these, with 22-ft. runners, are installed at Chicamaugua Dam.)

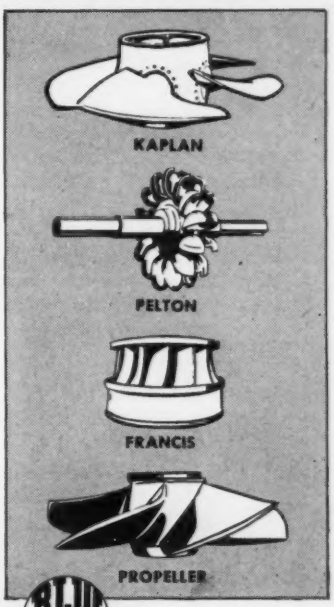
Baldwin *Pelton* (Impulse Type) Turbines take care of high heads, abrasive water conditions, or low-head, small horsepower installations. (A Baldwin Pelton-Type is operating under the highest head in the western hemisphere for this type . . . 2,562 feet.)

Baldwin *Francis* Turbines, assure top output with medium and high heads. (A Baldwin is serving on the highest head for this type—1,028 ft.—in the western hemisphere.)

Baldwin engineers will welcome a chance to work with you, in developing your project for maximum efficiency, at minimum cost.

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA 42, PA., U. S. A.

THE PELTON WATER WHEEL CO., SAN FRANCISCO, CAL.
I. P. MORRIS DEPARTMENT, EDDYSTONE, PA.



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BALDWIN
HYDRAULIC TURBINES

FOR
STRENGTH
AND
DURABILITY!
Silicon
BRONZE
BOLTS

Extra strength ... resistance to corrosion ... resistance to season cracking ... these are some of the qualities of Harper Silicon bronze fastenings which have led to their use by scores of power companies and electrical equipment manufacturers. These fastenings go into sub station assemblies, pot heads, pole line hardware, grounding equipment, and a host of other applications.

5200 ITEMS IN STOCK

Harper maintains a large and widely assorted stock of Silicon bronze bolts, nuts, screws, washers, and rivets. Moreover, similar stocks are maintained in brass, naval bronze, copper, Monel and stainless steel. Ask for summarized catalog.

ASK HARPER ENGINEERS

Harper engineers specialize in the manufacture and use of non-ferrous and stainless fastenings. Submit your fastening problems to them.

The H. M. HARPER COMPANY
2611 FLETCHER STREET
CHICAGO 18, ILLINOIS

Branches or representatives in principal cities

HARPER *Chicago*

EVERLASTING FASTENINGS

operation from either 24, 110 or 220-volt circuit, it requires a three-wire thermostat, pressure switch or other similar instrument for actuation. Electrical connections are made to a terminal block; half-inch threaded conduit is provided.

The unit provides automatic "on-off" operation of valves for steam, air, gas, oil or water. An induction motor develops the power drive through a worm and spur gear reduction. The limit switches are adjustable.

Valves may be of either globe or butterfly types. Globes may be either single or double seated in sizes ½ to 2½ in. with screw end connections; butterflies may be either screwed or flanged ends, in sizes 1 to 4 in.

TECHNICAL LITERATURE

Code—A suggested code of electrical practice applicable to the petroleum industry has been issued by the Institute of Petroleum, 26 Portland Place, London, England. Copies are available for 5s. 0d.

Thermosetting Products—Standards for Laminated Thermosetting Products, Publication No. 46-118, is available from the National Electrical Manufacturers Association, 155 East 44th St., New York, 17, N. Y., for 35 cents per copy.

Voltage Ratings—Interim report, Preferred Voltage Ratings for A.C. Systems and Equipment, is available from both Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y., and National Electrical Manufacturers Association, 144 East 44th St., New York 17, N. Y., for 50 cents in U. S. A. and 70 cents when sent to foreign countries. The report covers system voltages from 120 to 14,400 volts, inclusive, and corresponding apparatus voltage ratings.

Bearings—Papers and discussions presented as a Symposium on Testing of Bearings at A.S.T.M.'s annual meeting are available from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. at $1.50 per copy. It makes available the latest information on tests used, the equipment that has been developed, and the correlation of laboratory tests with field service.

Job Ratings—NEMA has released two new publications on job ratings. The first, Job Rating Manual, 1946 Edition, is available at a cost of $1.00 per copy; the second, Guide for Use of the Job Rating Manual, at a cost of $1.50 per copy. Both may be obtained from National Electrical Manufacturers Association, 155 East 44th St., New York 17, N. Y.

Tower Steps—"Specifications for Pole and Tower Steps" as approved by E.E.I. T.&D. Committee are available in a new publication, TD-15, 1946. The specifications, covering material, dimensions, strength, sizes, types and inspection, are available from Edison Electric Institute, 420 Lexington Ave., New York, N. Y.

Silicones—A bulletin describing the new engineering materials available to industry has been released by Dow Corning Corp., Midland, Mich. It also contains technical data and suggested uses for the compounds, greases, fluids, varnishes and resins described.

T.J. Cope INC.

QUICK COUPLING CONDUIT RODS

STRONG
EFFICIENT
SIMPLE & SURE LOCKING
LONG LIFE — LOW COST

Rodding conduits with Cope Equipment is the positive way. Engineered to the work, these rods lock securely—disengaging in the duct is an impossibility. Sticks of seasoned straight grained, second growth hickory, are well sanded and oil toughened insuring ease of handling and long life. The couplings, of best grade, annealed, malleable iron are power driven on the sticks and securely riveted. Made in 3' and 4' lengths with a straight shaft of 1" diameter. Cope Quick Coupling Conduit Rods will give years of dependable service.

For light weight, we offer Cope Aluminum Coupling Conduit Rods and Screw Coupling Conduit Rods, each a quality product for your needs.

FLEXIBLE CABLE FEEDER
LIGHT OR HEAVY CABLE FED WITH MINIMUM EFFORT

To facilitate the damage-free feeding of cable from the street reel into the conduit, Cope offers this flexible Cable Feeder. With a funnel-like mouth for easy application of pulling compound, the heavy 4" galvanized, flexible steel tubing has at the conduit end a steel sleeve which will accommodate various size brass nozzles to fit different sizes of conduits. For cable feeding, this Cope equipment assures complete protection.

It pays to specify Cope.
Write for our complete catalog.

T.J. Cope INC.
6120 Vine Street,
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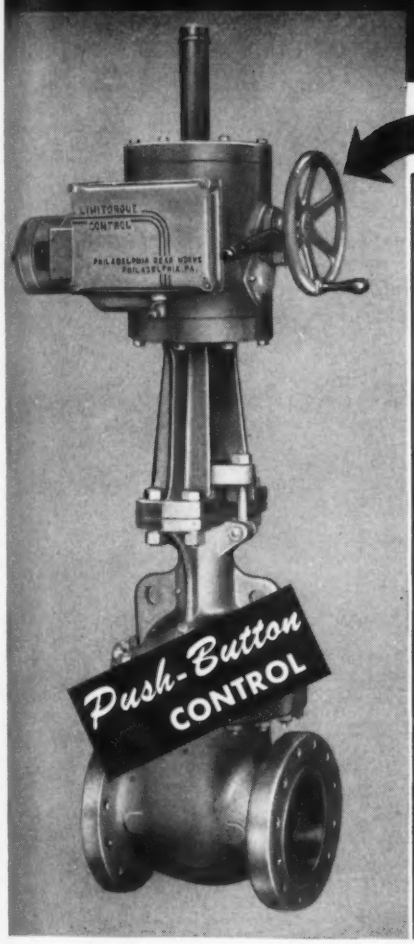
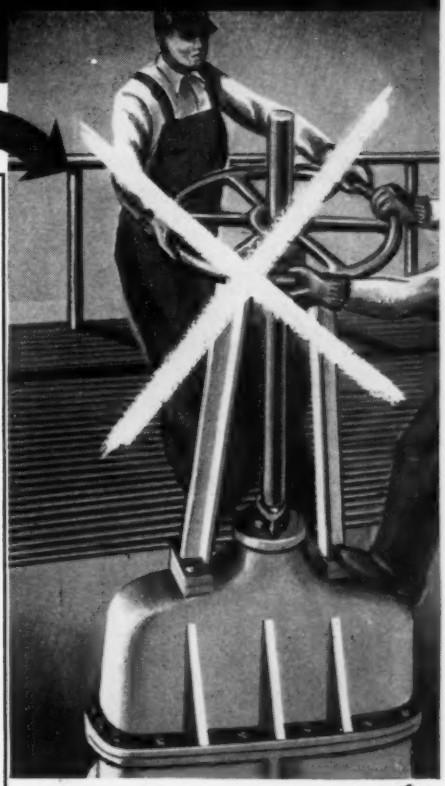
TOOLS AND EQUIPMENT
FOR THE INSTALLATION
AND MAINTENANCE OF CABLE
FOR OVER FIFTY YEARS

57% INCREASED PRODUCTION THROUGH *Limitorque* VALVE CONTROLS



This...not this

A prominent chemical manufacturer redesigned, several times, a special hand operated valve endeavoring to secure positive shut-off—this in order to avoid contamination of the product manufactured, and also endeavor to increase the yield—but their efforts met with no success. Our engineers were called in, and LimiTorque Valve Control was applied and operated by a momentary contact Push-Button Station. The result was that yield immediately jumped from 72% of anticipated to 113%—or an increase of 57%—and *all this was accomplished by the application of LimiTorque Controls.* Further, labor costs of two men on a hand wheel operating valve, for twelve minutes at a time, was reduced to *one-quarter of a second* through push-button actuation on a LimiTorque Valve Control. It is also interesting that the "controlled positive positioning" (through the torque-seating mechanism of the LimiTorque) coupled with "position indicating lights" in the Push-Button Station, made this possible.



THIS IS AN ACTUAL CASE HISTORY INVOLVING 116 LIMITORQUES

The word "LimiTorque" has a definite meaning because an exclusive patented Torque Switch actually limits the torque applied to the operating parts.

FEATURES OF THE "SM" TYPE LIMITORQUE (ABOVE)

1. Micrometer torque seating switch.
2. Self-contained unit—no gears, nut or bearings to buy.
3. Weatherproof, dust-tight and water-tight construction.
4. Hammerblow device.
5. Non-rotating handwheel built into the unit.
6. Automatic declutching.
7. One terminal board for all electrical connections.
8. High torque motors.
9. Simple valve yoke.

The "LimiTorque" (at left) is for valves working at low to medium temperatures, low to high pressures, and normal speed of operation.

This Unit is mounted on top of valve yoke . . . no extra gears, nuts or bearings required. Stem nut is inside and furnished with Unit. Nut is directly inside worm gear which drives it. (All clutches and connecting sleeves are eliminated.)

LimiTorque is designed for plug, cock, gate and globe valves . . . Entire Unit and nut can be lifted off valve yoke, by removing flange bolts, without disturbing wiring.

A special high starting torque motor, reduction gears, limit switches all in one weatherproof assembly—and all electrical connections are made to one terminal board, easily accessible by removal of watertight cover . . . Heat treated helical gears and hardened, ground and polished worm and bronze worm gear are used.

A handwheel is provided for manual operation and does not revolve during motor operation. During hand operation motor is mechanically disengaged. LimiTorque is always operative electrically. No danger to operator should he be turning handwheel when motor is started, since automatic clutch disengages handwheel instantly, without shock. Declutch lever changes from motor to hand operation. The usual LimiTorque "hammerblow" device allows motor to reach full speed before load is engaged. This imparts the "hammerblow" necessary to unseat sticking valve.

Torque seating switch insures tight valve closure without strain on valve parts. Protection from damage due to a foreign object obstructing closing is provided, because motor is shut off by thrust exerted on valve disc. Valve is protected during entire closing operation.

Philadelphia GEAR WORKS INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO . . . IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

NEWS ABOUT PEOPLE

Edgar Ingraham Elected President of Wholesalers

Edgar B. Ingraham, president of the Times Appliance Co., Inc., New York City, has been elected president of the National Electrical Wholesalers Association.

Ingraham, who received his electrical

E. B. INGRAHAM

engineering degree from Syracuse University in 1912, started his first appliance business, Times Appliance, in 1919 after his return from the Army, where he served as a first lieutenant of ordnance during the First World War. Previous to entering the Army, he had worked for General Electric Co. and Harris Forbes & Co.

In addition to his position with Times, he is president of Western Merchandise Distributors, Inc., chairman of the board and secretary-treasurer of Times-Columbia Distributors, Inc., secretary-treasurer of O. W. Ray Corp., and a director of the Niagara Blower Co., Buffalo.

He is also a member of the board of governors of the Electrical & Gas Association of New York and of the executive committee of the Westinghouse Agent Distributors.

•

▶ G. H. HAYSTEAD, manager of the Edison Electric Light & Power Co., Springhill, Nova Scotia, for the past 16 years, has succeeded J. W. MACDONALD as manager-superintendent of the Western Nova Scotia Electric Co., Yarmouth, N. S. Mr. MacDonald has been transferred to the head office of the Nova Scotia Light & Power Co., Halifax.

▶ G. R. MILNE, formerly assistant manager of system operation, Consolidated Edison Co. of New York, Inc., has been appointed manager of the system operation department. Mr. Milne joined the Consolidated Edison System in 1921.

•

William Milton Advanced to G.E. Vice-Presidency

William H. Milton, Jr., administrator of the Hanford Engineer Works, has been elected commercial vice-president

W. H. MILTON, JR.

of General Electric Co. for the District of Columbia, with headquarters in Washington. His new responsibilities will include customer relations for the District.

A graduate of the Virginia Military Institute in 1920, he soon became an engineer in the apparatus department at G.E.'s main plant at Schenectady. He was transferred to Philadelphia as a mining specialist and represented G.E. with the duPont de Nemours Co. until his appointment as sales manager of the plastics department in Pittsfield in 1938. With the formation of the chemical division in 1945, he became assistant general manager and last September was transferred to Hanford.

Birmingham Electric Elects Hawkins Vice-President

N. Hawthorne Hawkins, Jr., manager of Birmingham Electric Co.'s transportation department, Birmingham, Ala., has been elected a vice-president of the company.

After serving an apprenticeship with the company, he became a regular employee in 1927 as a customer contact

N. H. HAWKINS, JR.

representative in the Birmingham district office division where his duties consisted of handling customer complaints. In 1937 he was made manager of the Birmingham district office, but in that same year when the company organized a personnel department, Mr. Hawkins was appointed its director. Subsequently he was named to head the claim department. Remaining in the capacity of general claim agent, in 1944 he went into the transportation department as assistant manager, becoming manager in 1945. This position he still retains.

•

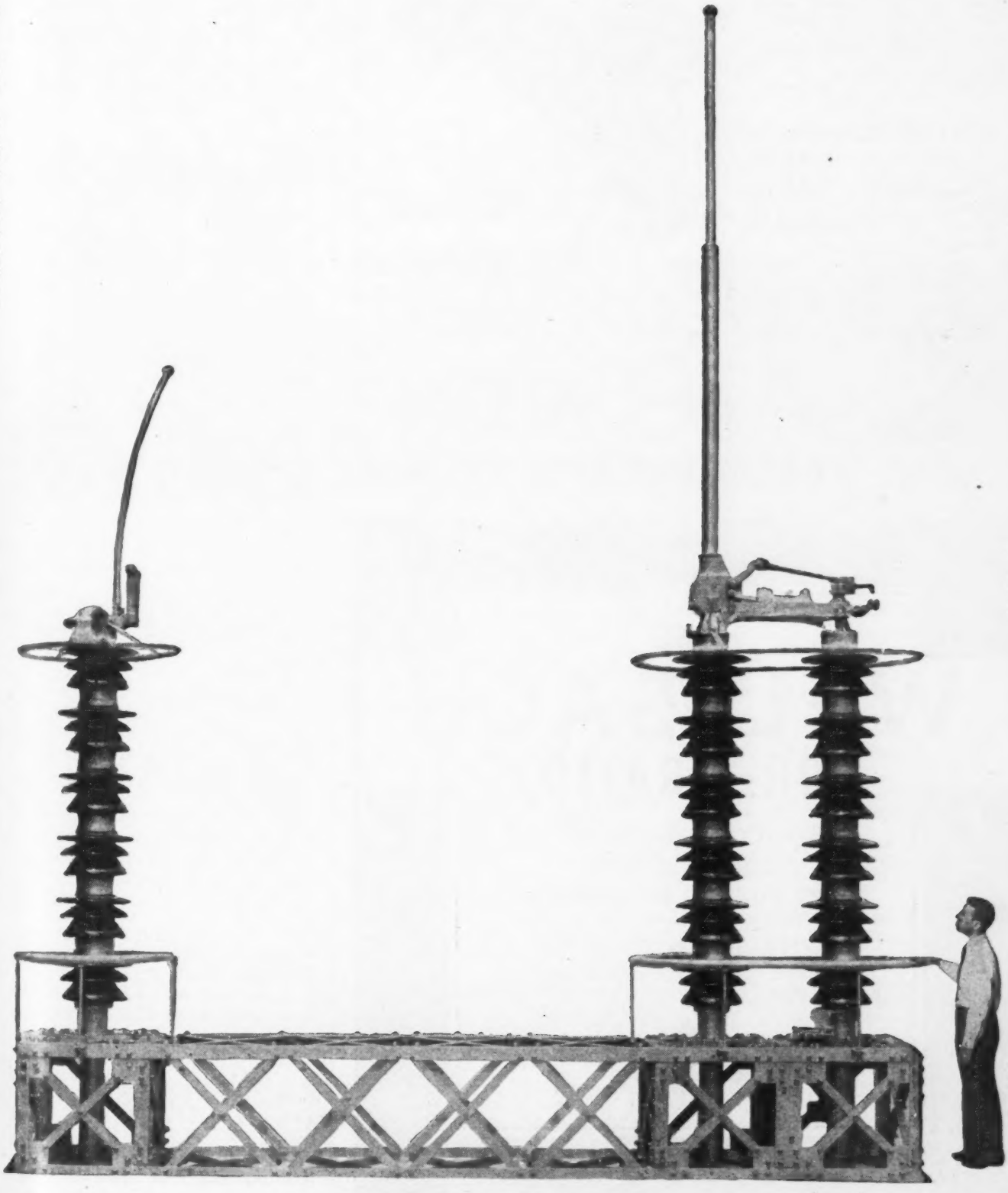
▶ R. A. MULHOLLAND, for the past three years in the employ of the Bureau of Sanitary Engineering of the Texas Department of Health, has become chief rate engineer for the Texas Board of Control.

▶ ARTHUR JACQUOT has been made manager of the Okanogan County P. U. D. of Okanogan, Wash., succeeding PAUL HAND, who has been appointed to a

Cole Electric Co.

8439 Steller Drive — Culver City, Calif.

AShley 4-3243



AIRBREAK DISCONNECTING SWITCH
230,000 Volts – 1200 Amperes, Type OU, T.P.S.T. Vertical Break, Group Operated. (One Pole Shown)

We Repeat... this **TRICO COMBINATION**

CAN'T BE BEAT!

RENEWABLE FUSES . .

The fuse with that "different" element. It's powder-packed, custom-built and engineered for maximum safety, dependability and to give THREE TIMES THE SERVICE. Built for service—not down to price.

KLIPLOK CLAMPS . . .

Lock fuses and clips together with vise-like pressure that counts. Eliminate unnecessary heating, fuse blowings, shutdowns and wasted current. A real dividend-paying investment!

TRY THIS FAMOUS TRICO COMBINATION TODAY!

"THE INSIDE STORY OF TRICO RENEWABLE FUSES" . . .

24 pages of fuse facts! Quick-reading . . . informative . . . profusely illustrated. Tells how you can get maximum returns from your fuse investment. Write for your FREE copy today!

TRICO

REG. U. S. PAT. OFF.

TRICO FUSE MFG. CO. Milwaukee, Wis.

THE

WELSBACH CORPORATION

UTILITY MANAGEMENT
CONSTRUCTION
STREET LIGHTING MAINTENANCE

CONSULTANTS ON ALL
PHASES OF UTILITY OPERATION

WELSBACH

1500 WALNUT ST., PHILA. 2, PA.

similar position with the Central Lincoln County P. U. D. at Newport, Ore. Mr. Hand had been manager of the P. U. D. since its organization in 1935. Mr. Jacquot was formerly district manager of the North Central District of the Bonneville Power Administration at Wenatchee, Wash.

•

D. J. O'Conor, Jr., Elected Formica Vice-President

D. J. O'Conor, Jr., assistant chief engineer of Formica Insulation Co., Cincinnati, has been elected a vice-president, assistant to the president, and a director, and John D. Cochrane, Jr., a member of the research staff, has been chosen director of the company's research development department.

D. J. O'Conor, Jr.

O'Conor, a son of the president and co-founder of the company, is an electrical engineering graduate of Massachusetts Institute of Technology, class of 1937. He served for three years with the Allis-Chalmers Manufacturing Co. in Milwaukee.

Cochrane, a chemical engineer, has been associated with Formica's research department for 22 years. He is a graduate of M.I.T.

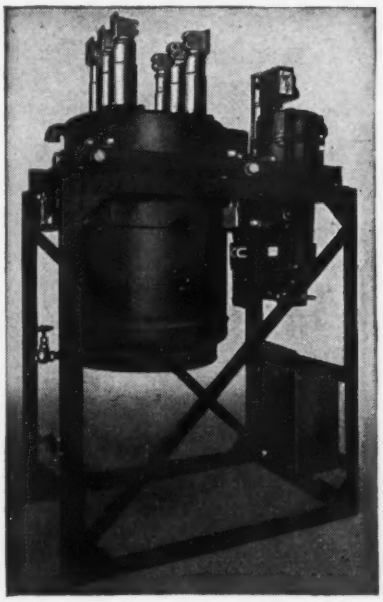
•

▶ Hugh C. Thuerk, president of the New Jersey Power & Light Co., Dover, N. J., has been elected a director of the New Jersey State Chamber of Commerce.

▶ L. Dale Hill has been appointed labor relations consultant for the New York area of the Atomic Energy Commission. A member of the industrial relations firm of L. Dale Hill & Co., New York, Mr. Hill served during the war as a labor relations officer with the Manhattan Engineer District. In

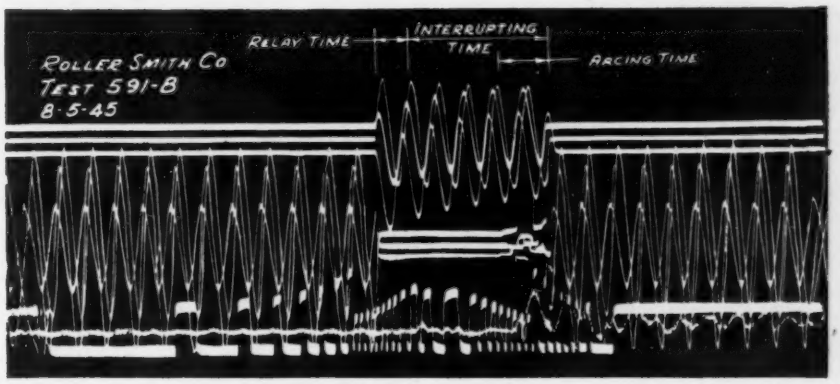
Proved!

ROLLER-SMITH

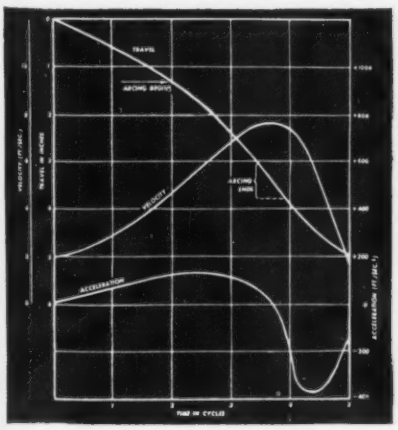


150 TCR-5 Exotherm Type Oil Circuit Breaker. 15,000 volts. 600 Amperes. 150,000 KVA Interrupting Capacity.

Circuit Breakers Add 38% Safety Factor Over Present Accepted Standards!



Typical test oscillogram of Roller-Smith oil circuit breaker employing Exotherm principle. Note 5 cycle interrupting time.



Curves of acceleration, velocity and arcing time derived from breaker test oscillogram.

Utilities have accepted the Roller-Smith oil circuit breaker with the Exotherm principle of arc extinction — this over a period of almost two years when it was first introduced.

They have found the principle gave what was promised: 5 cycle opening consistently, a 38% safety factor over present accepted standards! By the principle, the arc is put out by use of its gas generated energy instead of merely stretching the arc. Users are assured greater protection to equipment by this higher opening speed.

The operation of a confining chamber to quench the arc rapidly is based on the known properties of gas conductivity. It decreases with decrease in gas temperature and also with an increase in pressure. In the quencher the cooling of the arc extracts its energy and reduces the temperature, with the enclosure building up the gas pressure to become less conducting and the combination puts out the arc.

For full information on the Exotherm principle applied to Roller-Smith oil circuit breakers, write us today.

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Manufacturers of Standard and Precision Electrical Instruments • Precision Balances • Air Circuit Breakers • Rotary Switches • Switchgear • Relays

Oil Circuit Breakers

MANAGEMENT and PRODUCTION men want

FACTS

about equipment they buy

Here are FACTS about

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"SAFETY-PULL"
Ratchet Lever Hoists

For all kinds of construction and maintenance work, wherever a lift or pull is needed, there is a "Safety - Pull" to meet your requirements. SAFE, DURABLE, DEPENDABLE. Capacities range from ¾ to 15 tons, yet they weigh only 14 to 150 pounds.

"QUIK-LIFT"
Electric Hoists

For dependable and economical service the "Quik - Lift" incorporates EFFICIENCY with SPEED, POWER and DURABILITY. Just plug it in and speed up production. Capacities from 500 to 4000 pounds with lifting speeds from 4 to 49 feet per minute.

MODEL Y-C
Spur Geared Chain Hoists

Coffing Spur Geared Chain Hoists embody the planetary gear system with the Weston automatic brake. There are seven capacities ranging from ½ to 5 tons. A sturdy, dependable hoist for heavy work and in the production line.

Contact Your Supplier or Write for BULLETIN EC-100

Coffing Hoist Co.
Danville, Illinois U. S. A.

this capacity he was responsible for the handling of industrial relations problems and for the procurement of highly skilled technicians needed in the atomic bomb project.

•

Quebec Hydro Announces Engineering Appointments

Quebec Hydro-Electric Commission has announced the appointment of R. N. Coke as chief engineer of the new operation division. Max Sauer is chief engineer of generating plants and hydraulics division, and George Read becomes chief engineer of engineering design division.

H. Milliken has retired as chief engineer and general superintendent of Hydro.

•

► GEORGE K. VENCILL has been appointed chief hydraulic engineer of the Union Electric Co., St. Louis. Mr. Vencill has been with the company for 16 years. He is a member of the American Institute of Electrical Engineers.

► R. W. LARSON, formerly assistant to the chief engineer, Radio Corp. of America, at Lancaster, Pa., has been appointed administrative assistant to the director of the research laboratory of the General Electric Co., Schenectady. Mr. Larson first joined the General Electric Co. in 1922. In 1930 he was one of a group which formed the nucleus of the vacuum tube engineering department. When this became the tube division of the electronics department, Mr. Larson was named assistant engineer. He left the company in 1943 to become technical aide and deputy chief of division 15 of the National Defense Research Committee. He became consultant for the division when he joined RCA in 1944.

► WILLIAM C. GRAHAM has been appointed to the staff of the National Electrical Manufacturers Association as promotion manager for the rural and suburban market development program, succeeding M. W. THOMPSON, who resigned last December. Mr. Graham has had advertising and promotional experience with Eastman Kodak Co. and was editor of *Building America* magazine. As director of publications for the Newark Safety Council he edited a monthly magazine and handled all publicity.

► MICHAEL P. WALKER has been appointed general sales manager of the Aluminum Solder Corp., New York City.

Philco Appoints J. M. Otter General Sales Manager

Promotion of John M. Otter to the position of general sales manager of Philco Corp. has been announced. Mr. Otter has been a member of the Philco organization since 1926 and for the past three years he has been sales manager of the radio division.

A young veteran of the radio and

Wanamaker-Underwood & Underwood

J. M. OTTER

appliance industry, with 21 years of active Philco sales experience behind him, Mr. Otter has been selected for the key position of general sales manager because of his record in helping to create the nationwide Philco selling organization.

•

► WILLIAM F. ROONEY, who has been in charge of the Sylvania Lighting Center in New York City, has been placed in charge of merchandise activity for Edwards & Co., Norwalk, Conn.

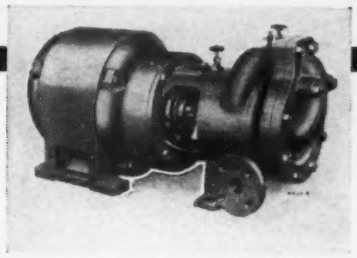
► C. C. CHAMBERLAIN, general sales manager of Jenkins Bros., New York, N. Y., has been elected a vice-president of the company. On graduation from Hamilton College in 1929, he started as an assistant in the advertising department. In turn he has been advertising manager, publicity manager, and since 1942 sales manager.

► RALPH D. HOLCOMB, manager of the San Francisco district for the Harnischfeger Corp., Milwaukee, has been made general sales manager.

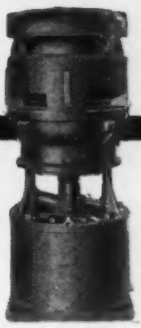
► ELMER SCHNEIDER has been elected vice-president and director of engineering of Wheelco Instruments Co., Chicago. In this newly created position, he will take charge of all engineering activities of Wheelco including

BOILER-FEED PUMPS
for the Exacting Engineer

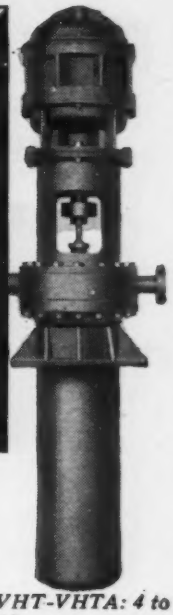
RT: 4 to 8 stages; pressures to 1200 lb, capacities to 2000 gal per min.



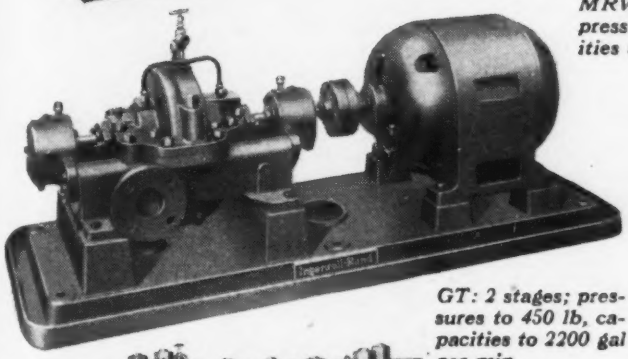
MRV: 2-stage Motorpump, pressures up to 200 lb, capacities to 275 gal per min.



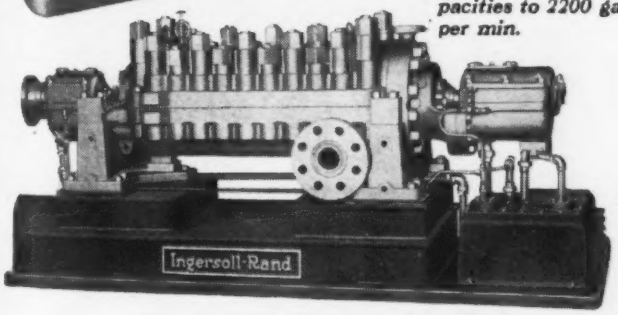
MRVH: 4-stage Motorpump, pressures to 260 lb, capacities to 75 gal per min.



VHT-VHTA: 4 to 30 stages; pressures to 1500 lb, capacities to 350 gal per min.



GT: 2 stages; pressures to 450 lb, capacities to 2200 gal per min.



Here is a line of feedwater pumps that satisfies, yes, even exceeds, the specifications of the most exacting boiler plant engineer. That's because there's a lot of clear thinking, a superb research organization, and 75 years experience behind the Ingersoll-Rand Cameron line of boiler-feed pumps.

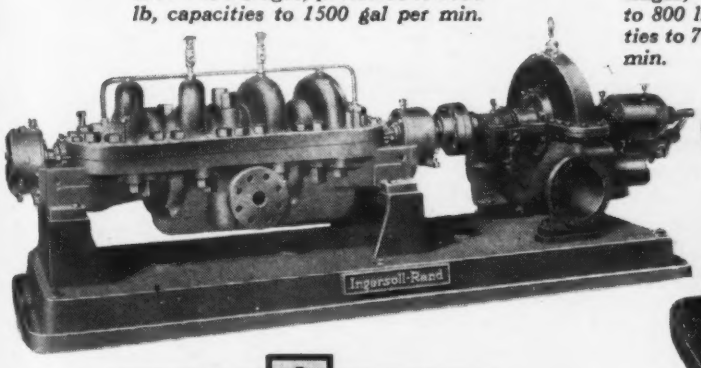
There is a pump in this line-up for any plant from the smallest to those big, high-pressure jobs that make the headlines. Regardless of size and duty, they are all built with the same exacting care that has made the trademark, I-R, a symbol of confidence in the field of hydraulics.

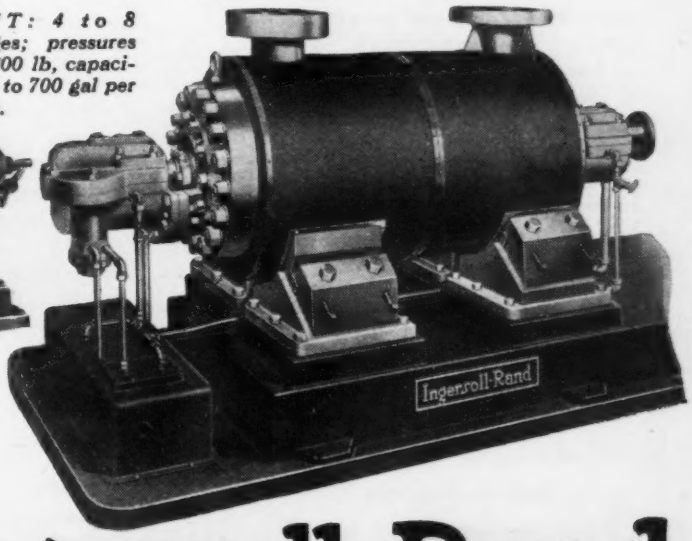
Call your nearest I-R engineer for literature or consultation. There's no obligation—just the desire to help you get the best in performance and long service.

CHT: 6 to 8 stages; pressures to 3000 lb, capacities to 2500 gal per min.

CNT: 4 to 8 stages; pressures to 800 lb, capacities to 700 gal per min.

HT: 4 to 9 stages; pressures to 1600 lb, capacities to 1500 gal per min.





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CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

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Where and How to Use *Crapo* Steel Conductor

Ask for This Guide to Low-Cost Rural Lines!

If future plans call for the extension of rural service, be sure to ask for a copy of this Manual! A study of its contents will show where and how *Crapo* Steel Conductors can be used to profitable advantage in rural distribution systems.

This illustrated book contains pertinent data on the electrical characteristics and electrical performance of these unique conductors. It shows how construction costs can be reduced by the use of long spans, gives initial and final sag and tension data, describes construction practices, cites typical installations.

Crapo Steel Conductors are especially applicable to rural taps and branches where construction and maintenance costs are important considerations. The experience of a number of leading utilities over a period of years shows conclusively that *Crapo* Steel Conductors are giving dependable, economical and efficient service on thousands of miles of line in rural areas.

Crapo Steel Conductors are distributed by Graybar Electric Company, Inc. Ask a Graybar representative for a copy of the *Crapo* Steel Conductor Manual or write direct for Manual No. 110-C.

Indiana Steel & Wire Company
Muncie, Indiana

Crapo Steel Conductors

inspection and approval of quality standards. JOSEPH A. REINHARDT will become plant manager and assume responsibility for all manufacturing operations.

•

Virginia Electric Elects Barnes Board Chairman

Virginia Electric & Power Co. has announced the election of Donald C. Barnes as chairman of the board of directors. Mr. Barnes goes to the Virginia utility from his position as president of the Engineers Public Service Co. of New York, the holding company which controlled Virginia Electric & Power and other utilities and which now is dissolving following a long controversy with the Securities and Exchange Commission.

Under the new set-up, Jack G. Holtzclaw will continue as president.

Mr. Barnes began his career in the utility business in Birmingham, Ala., with the Birmingham Railway & Electric Co. and later was employed by the Arkansas Power & Light Co. in Little Rock. He subsequently directed operation of utility properties in Massachusetts and Rhode Island and in Everett and Seattle, Wash. In 1924 he was made district manager for properties operated by Stone & Webster in Washington, Nevada, Florida and Georgia and since 1931 he has served as an official of Engineers Public Service Co., of which he has been president for the past ten years.

OBITUARY

Harry Bacharach

Harry Bacharach, 73, executive director of the New Jersey Utilities Association, died May 13 at his home in Atlantic City. A Republican, he had been active in politics for many years. He served as president of the City Council in 1900. He afterwards served as postmaster for eight years and served many years as mayor.

In 1921, he was appointed to the New Jersey Board of Public Utility Commissioners for a two-year term, and in 1929, he was reappointed and served until 1941, when he became executive director of the Utilities Association.

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► GEORGE O. SPENCER, assistant director of the public utilities division of the Securities and Exchange Commission, died at his home in Narberth, Pa., on May 3. He was 61 years old. A graduate of the Wharton School of Business and Finance of the University of Pennsylvania, Mr. Spencer joined the commission in 1935 and two years later was named assistant director of the public utilities division. Between 1925 and 1934 Mr. Spencer was senior vice-president, treasurer and director of the New England Public Service Co., later becoming special assistant to the president of the company.

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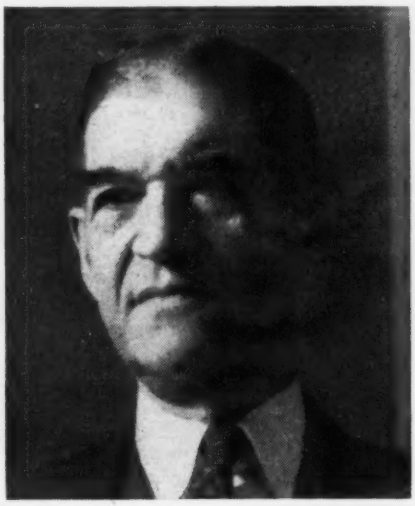
Thomas J. Bostwick

Thomas J. Bostwick, consulting electrical engineer for the Aluminum Co. of America, died May 8, at his home in



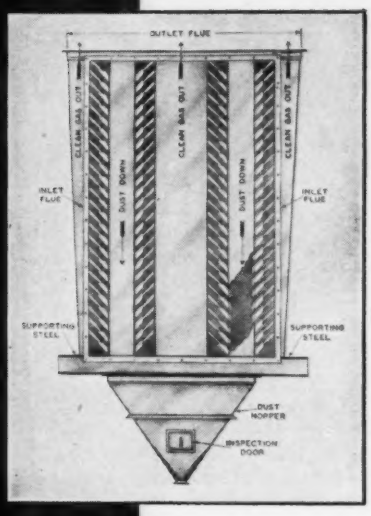
Park Mansions, Pittsburgh. He retired from full-time duty in 1946, after having served the company for 46 years, the last 22 of them as chief engineer.

After joining Alcoa in 1900 at the Niagara Falls Works, he directed a program of electrical development for the company that was unequalled in magnitude by any other private industry in America. Under his guidance, the company installed over 500,000 kw. of generating capacity and 800,000 kw. of conversion equipment in its privately owned operations and approximately 1,500,000 kw. of conversion capacity for government-owned, Alcoa-operated aluminum plants during World War II.

Born at Oswego, N. Y., in 1876, Bostwick was educated in Buffalo, where he studied electrical engineering at the Technical Engineering School. He was a member of the American Institute of Electrical Engineers.

•

► DR. LYMAN F. MOREHOUSE, formerly technical representative in Europe for the American Telephone & Telegraph Co. and the Bell Telephone Laboratories, died on May 1 in Newark, N. J. He was 73 years old. After teaching electrical engineering, Dr. Morehouse joined the Bell System in London as a



New in Design ❧ Old in Reputation

. . . the New Aerotec Design 3 tube for fly ash collection

Here's the latest development in *High Efficiency, Minimum Maintenance* fly ash collection for utility power plants.

From a highly successful background as the fly ash eliminator between combustor and rotor in the new coal-fired gas turbine driven locomotive development, the Aerotec Design 3 tube is now in large scale production for power plant fly ash control.

Permanent mold, aluminum alloy casting, developed in cooperation with the Aluminum Company of America, has produced an exceptionally light weight tube with absolute uniformity, yet capable of resisting erosion as effectively as harder steel or cast iron tubes submitted to the same tests. Research on, and application of this tube have proved conclusively that:

- **It offers the most compact collector for utility power plants available today.**
- **It has the highest efficiency of any mechanical unit on the market.**
- **Its gross weight per cu. ft. capacity is far below other tubular dust collectors.**
- **Simplicity of connections and reduced weight keep installation and erection costs to a minimum.**
- **Mass production of the Design 3 tube gives utility power plants the advantage of a low primary cost.**

The Aerotec Design 3 may be the answer to your dust problem. Why not call our field engineer nearest you, or write us.

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PROJECT & SALES ENGINEERS

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The Project Engineer (formerly Thermix Topix) is a magazine of limited circulation dealing with project engineering problems and their solutions. A request will put your name on our list.

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GREENWICH, CONN.

You can locate ground faults within one span without climbing poles with the Raytron Electronic Fault Locator. Simply energize the circuit from the section break with a capacitor and carry the Raytron Locator along the line. At line intersections or lateral taps the locator meter will tell you which way to drive and point out the fault within one span. The locator will operate up to 100 yards from the line.

The Raytron Method of tracing faults saves many hours locating ground faults on all types of overhead distribution lines. Invisible storm damage, damaged lightning arrestors and other hard-to-locate faults can be found quickly. Not affected by weather

Get proof that Raytron Locator will locate faults faster and help you restore service sooner. Ask for a demonstration of Raytron Electronic Fault Locator. You will not be obligated. Write Today.

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under all sorts of operating conditions

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NEMA 34.5-KV Switch Insulator

At Victor, every step in the making of porcelain is carefully controlled. From design to final inspection, safety and long-life is built into each high voltage insulator. For satisfaction always look to Victor.

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BIRTHPLACE OF FIRST WET PROCESS HIGH VOLTAGE INSULATORS

transmission engineer for the Western Electric Co. Returning to New York as equipment engineer for A. T. & T., in 1934 he was appointed assistant director of systems development at the Bell Telephone Laboratories. He returned to England in 1935 as technical representative. Dr. Morehouse retired from the American Telephone & Telegraph in 1939.

▶ WILLIAM H. KELSEY, industrialist and electrical engineer, died at his home in Cleveland Heights, Ohio, on April 29. He was 75 years old. Mr. Kelsey had been president and treasurer of the Industrial Heating Manufacturing Co., Cleveland, since its organization 28 years ago. He was a graduate of Harvard University and held a degree from the Cleveland School of Law.

▶ EDWARD S. PRESTON, formerly president of the Chicago Electric Manufacturing Co., died on May 1 in Chicago at the age of 63. Mr. Preston became general manager of the Chicago Electric Manufacturing Co. in 1916 and later served for nine years as president of the company.

▶ WALLACE K. BROWN, 63, retired vice-president of the Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J., died May 12, at Montclair, N. J. An electrical engineer, he had been with the company for 39 years before his retirement last October. He became vice-president and general sales manager in 1938. Last winter, he was connected with the Ford Instrument Co. on Long Island.

▶ CLARENCE A. GRAHAM, 61, former chief electrician for the Birmingham Division of the Louisville & Nashville R. R., died May 8, in Birmingham, Ala.

▶ FRANK L. FERGUSON, 66, personnel director of the Ansonia Electric Co., died May 7. As a young man, he organized the Hessel & Hoppen Co., New Haven, and was president of the company when it was sold to the Westinghouse Electric Supply Co.

▶ EDWIN W. NEWCOMB, Pacific Coast sales manager for the primary battery division of Thomas A. Edison, Inc., Bloomfield, N. J., died at Oakland, Cal., on March 22 after a long illness. Born in Sebago, Me., 76 years ago, Mr. Newcomb had held the position he occupied at the time of his death since 1914.

▶ CLYDE ARTHUR JONES, 39, advertising manager of the *General Electric Review*, Schenectady, N. Y., died May 11, at Milton, Va.

HOW TO MAKE POLES LAST LONGER

Just off the press. A factual booklet describing 12 years field experience with OSMOPLASTIC in ground line treatment of standing poles as well as other timbers. Explains the Osmoplastic method of treatment in detail. Write for your copy.

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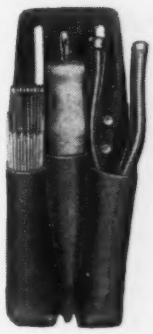
BELT SUPPORT A new, more comfortable and practical belt support that permits greater freedom of arms and shoulders . . . safer . . . less likely to entangle with any work. Cat. No. 257.



LINEMAN'S TOOL POUCH

Rugged leather pouch, stoutly riveted and stitched. Carries rule, pliers and knife. Cat. No. 651

TOOL HOLSTER NO. 650

One large, two small, and two deep wing pockets for various tools. Knife snap optional on all Buckingham tool pouches and holsters.

LEATHER TOOL BAG NO. 303

Made of heavy, durable leather. Stoutly stitched and riveted to give years of service. Convenient for carrying emergency kit, repair tools, work clothes, etc. 15" long by 6½" wide x 7" deep.

ELECTRICIAN'S BELT NO. 85

Made of 1½"-wide durable leather. Fitted with nickel plated buckle, snap, tapeholder and tool loop. Accommodates Buckingham tool pouches and holsters.

RUBBER GLOVE BAG

8/0 vat-dyed olive drab duck. 16" x 8" x 4". Provided with belt snap. Keeps gloves dry and clean, and you can't lose them off your belt. No. 400

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Write today FOR NEW ILLUSTRATED FOLDER ON MECHANICS POUCHES!

BUCKINGHAM MANUFACTURING CO., INC.

Walter E. Craw, Pres. 5-7 Travis St., Binghamton, N. Y.

MANUFACTURERS & MARKETS

Sustained Demand for Electric Motors Predicted by Industry; Output Up

With a "real" backlog large enough to carry the industry through 1947, motor manufacturers feel optimistic about future business prospects, the National Electrical Manufacturers reported this week. Quantities involved in new orders are still greater than shipments and the backlog at the close of 1946 approximated 48,000,000 units.

In dollars, the present backlog represents $632,000,000. Of this, fractionals comprise 94 percent of the total units and about 46 percent of the dollar value. A cross section of manufacturers in NEMA's motor and generator section predict "a long period of large-scale production before the supply of motors will meet the demand."

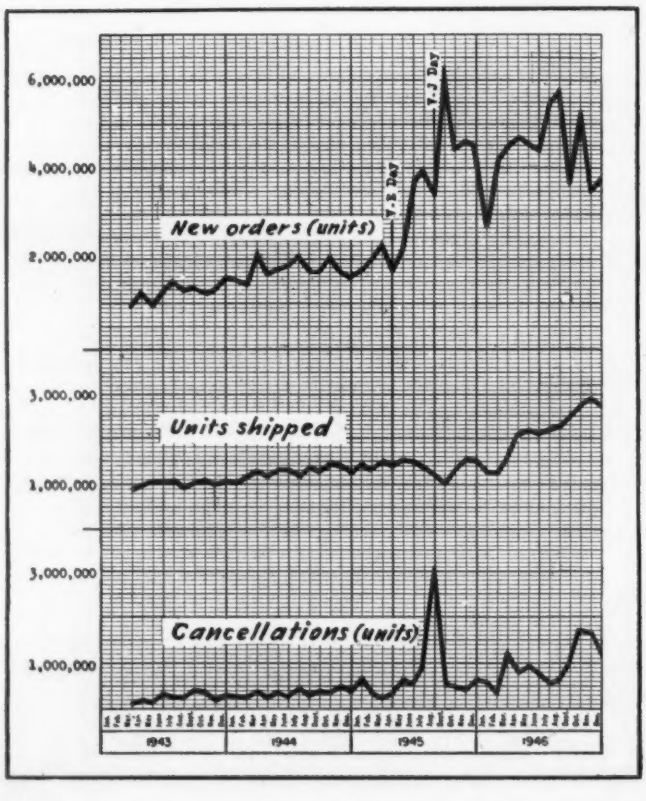
Among the reasons given for the unprecedented demand for motors are trend toward unit drives in industry and the heavy demand of the appliance field. It was stated, as an example, that last year shipments of oil burners totaled 579,453 units, compared with a pre-war high of 333,250 units in 1941. Typical estimates for 1947 production of motor using appliances were given as follows: household refrigerators, 3½ million; vacuum cleaners, 2 million; washers, 2 million; ironers, ½ million; sewing machines, 1 million; dishwashers, home freezers, clothes driers, and electric fans, 2½ million. One manufacturer stated that even if there were a saturated market in appliances, motor replacements over the next five years would have to take care of the five-year war period during which there were no appreciable replacements in industry.

While shipments of fractional motors increased from 1,144,498 units in January, 1946, to 2,561,254 a month in December, the manufacturers believe that peak production is some months away. Present output is being governed by materials available. Among materials short at the present time are insulating varnishes, copper, sheet steel, castings and hardware, the report states.

CPA reported earlier that the total number of units ordered in 1946 totaled 53,003,874. Of this number, 25,541,796 were shipped, 11,006,028 were cancelled, and the remainder added to the backlog bringing that total to 48,000,000. Of the total produced in 1946, 233,366 units with a value of $15,326,524 (6 percent of total dollar volume) were exported.

Unfilled Orders on Jan. 1, 1947

Apparatus	No. of Units	$Value
Fractional Hp	45,384,000	$292,600,000
Integral Hp (1-200 hp.)		
A.C. Polyphase	1,830,800	218,653,000
A.C. Single Phase	704,400	38,000,000
Direct Current	99,650	67,581,000
Large Motors (above 200 hp.)	3,790	15,600,000
Totals	48,022,640	$632,434,000



UP, UP—Trend in new orders, shipments, and cancellations by months for all types and sizes of motors and generators from 1943 to 1946. A backlog, large enough to carry the industry through 1947, represents $632,000,000. Fractionals play an important part in the motor picture. They comprise 94 per cent of the total units of the backlog and 46 percent of the dollar value. Shipments of fractional motors increased from 1,144,498 units in January, 1946, to 2,561,254 a month in December.

One of the significant steps taken by the industry during 1946 was the development of a broad new program of fractional-horsepower motor standards. The program is designed to increase output, decrease costs, and insure proper application by and long term savings to ultimate users.

The manufacturers pointed out that although the outlook for the foreseeable future is good, "large-scale wage demands, work stoppages and higher price levels could again throttle the industry."

•

Lindberg, Fisher Companies Combine Organizations

Lindberg Engineering Co., Chicago, manufacturer of heat treating furnaces and electrical equipment, and Fisher Furnace Co., Chicago, manufacturer of non-ferrous melting furnaces, refractories, and blowers have recently united their organizations, according to an announcement by L. A. Lindberg.

First furnace development of the combined organization is the new Lindberg-Fisher induction melting furnace. Detailed information on this new unit is soon to be released.

Under the new arrangement the Fisher organization will be known as Fisher Furnace Division, Lindberg En-

GREGORY TRANSFORMERS
. . . JULY DELIVERY!

850 —15 K.V.A. Gregory, Type HE, continuous duty 55 Deg C rise, 2400 volts primary, 120/240 volt secondary, single phase, 60 cycle, oil immersed self-cooled distribution outdoor transformers, complete with new transformer oil, and standard NEMA accessories.

These are new transformers manufactured by Gregory to strict specifications in accordance with NEMA and AIEE requirements.

PERCENT EFFICIENCIES OF TRANSFORMERS

¼ Load	½ Load	¾ Load	Full Load
97.5	97.9	97.7	97.5

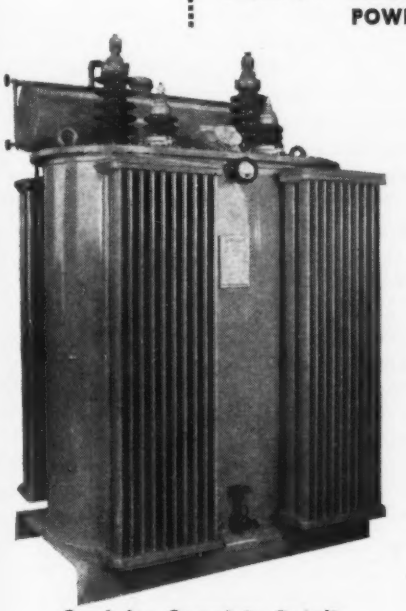
These transformers are furnished in round heavy gauge steel tanks suitable for pole or platform mounting with wet process porcelain solderless stud type primary and secondary bushings.

150 15 K.V.A. Gregory, Type HET, continuous duty 55 Deg C rise, 2400 volt primary, 230 volt secondary, 3 phase, 60 cycle, oil immersed self-cooled distribution outdoor transformers, complete with new transformer oil and standard NEMA accessories.

100 15 K.V.A. Gregory, Type HET, continuous duty 55 Deg C rise, 4800 volt primary, 460 volt secondary, 3 phase, 60 cycle, oil immersed self-cooled distribution outdoor transformers, complete with new transformer oil and standard NEMA accessories.

These transformers have an approximate 10% full capacity secondary tap to compensate a possible voltage drop. They are suitable for pole or platform mounting and are equipped with wet process porcelain stud type primary and secondary bushings.

NEW GREGORY TRANSFORMERS
POWER DISTRIBUTION AND SPECIAL TYPES



Send for Complete Details
Order NOW!

- UNIQUE DESIGN—afford low copper and core losses—extra factor of safety protects against temporary overloads or power surges.
- CONSTRUCTION — tanks constructed of heavy gauge copper bearing steel welded throughout.
- OIL—Hi-Grade insulating oil used exclusively.
- BUSHINGS—Highest grade of wet process porcelain.
- ACCESSORIES—Highest Quality obtainable meeting our exacting requirements.
- INSULATION—Coordinated with bushings to protect against surges.

SPECIAL NOTICE

We are now accepting orders on New Gregory Transformers for delivery in the fourth quarter of 1947. Orders will be filled in priority of date received.

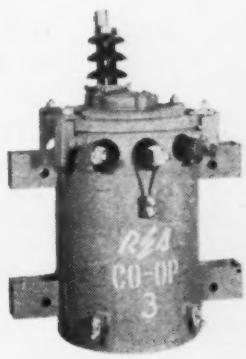
August deliveries on the following:

2400 Volts Primary, 120/240 Volts Sec.
25, 37½, 50, 75 & 100 KVA

2400 V. Primary, 240x480 V. Secondary.
25, 27½, 50, 75 & 100 KVA

2400 V. Pri., 120/240 or 240x480 V. Sec.
333 KVA 500 KVA 1000 KVA

22000 V. Primary, 2400 or 240/480 V. Sec.
833 KVA 1000 KVA



3 K.V.A. Gregory Rural Conventional Distribution Transformer 7200/12,470 Y Volt Primary, With Standard Taps, 120/240 Volt Secondary, Single Phase, 60 Cycle.

Gregory Rural Distribution Transformers are approved by the Rural Electrification Administration, Washington D. C.

All transformers manufactured by Gregory Electric Company are thoroughly tested in conformance with A.I.E.E. and covered by an iron clad liberal standard one year guarantee.

GREGORY ESTABLISHED 1893 Hi-Grade

GREGORY ELECTRIC CO.

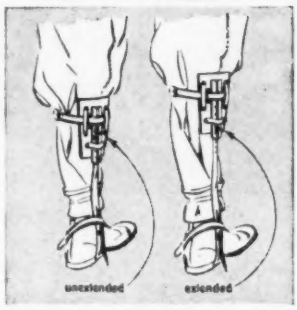
2537 SOUTH STATE STREET **CHICAGO 16, ILL.**

PHONE: CALUMET 2822

THE SAFEST CLIMBER . . .

IS THE CLIMBER THAT *FITS*

The easily-adjustable top of the Brooks Safety Climber permits it to fit any lineman perfectly. On a short leg or a long leg, it's comfortable and it's *safe*. Every part of every Brooks Climber is top quality. Gaffs and shanks are correctly designed of alloy steels . . . leather parts are soft and pliable, but strong. Get the facts about Brooks—the adjustable climber that fits *any* lineman. Write for illustrated literature and prices.

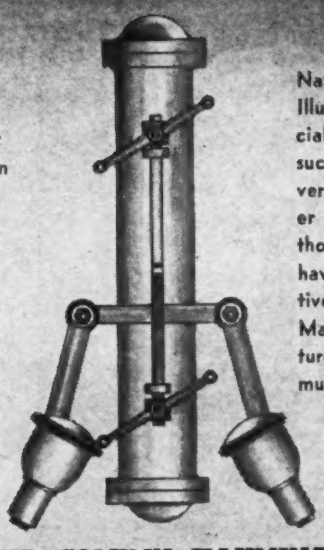


Brooks climber shanks and gaffs are manufactured by Melling Forging Co., Lansing, Mich. and standard and deluxe leather attachments are manufactured by the Portable Products Corporation. Complete climbers and parts are sold by Portable Products Corporation, Kellog Switchboard & Supply Co. of Chicago, Automatic Electric Sales Corp. of Chicago, and other distributors of Strauss Safety Equipment throughout the country. Manufactured and sold under U. S. Patent No. 1,956,852.

PORTABLE SAFETY DIVISION
PORTABLE PRODUCTS CORPORATION
420 BLVD. OF ALLIES . . PITTSBURGH 19, PENNA.

POWER PLANT EQUIPMENT
PROVEN PRODUCTS

Embodying the Basic Features of meniscus reflection by Controlled Illumination



National Water Column Illuminators are highly specialized products. They successfully meet the severe requirements of power station work, and thousands of applications have proved their effectiveness and reliability. Made by the manufacturers of National Communication Equipment.

WATER COLUMN ILLUMINATORS

FOR FURTHER INFORMATION WRITE TO DEPARTMENT 181

NATIONAL COMPANY, INC.
61 Sherman Street — Malden 48, Mass.
MANUFACTURERS OF NATIONAL COMMUNICATION EQUIPMENT

gineering Co. Kenneth D. Hoke, formerly vice-president of Fisher will head this division. Fisher furnace manufacturing and office activities have been moved to the main Lindberg office and plant at 2444 W. Hubbard Street, Chicago. Refractories will continue to be manufactured at a second plant located at 5535 N. Wolcott, Chicago.

•

First Quarter Profit for G.E. $16,763,650

General Electric Co.'s profit available for dividends for the three months ended March 31 amounted to $16,763,650, or 58 cents a share of common stock, President Charles E. Wilson announced at the recent annual meeting of the company's stockholders. He stated that this net income reflected the receipt of $5,306,835 of non-recurring income resulting from the liquidation of Electrical Securities Corp., an investment affiliate. In the corresponding period last year the company's operations resulted in a loss of $13,701,580, or 47 cents a share, due to a strike which closed all of its principal plants for nine weeks.

"Net sales billed in the first quarter of 1947 totaled $233,819,167, compared with $257,638,780 billed in the final three months of 1946," Mr. Wilson stated. "In the first quarter last year, the sales were only $60,426,744, due principally to the fact that it was not possible to make shipments while the strike was in effect."

•

Copperweld Steel, Wire Units Booked Nearly at Capacity

Copperweld Steel Co.'s wire division at Glassport, Pa., and steel division at Warren, Ohio, are booked practically at capacity for the rest of this year, S. E. Bramer, president, told stockholders at the recent annual meeting.

Earnings in 1947 will be far better than in 1946, provided there are no further disturbances in the labor situation, Mr. Bramer said.

Copperweld earned $255,311 or 46 cents per share in the first quarter of this year. The company's net for all 1946 was $439,777, or 69 cents a share.

•

Emerson Increases Prices

Emerson Electric Mfg. Co., St. Louis, finds it necessary to increase prices an average of 7 percent, O. C. Schmitt, president, informed stockholders last week. Stating that the company was in accord with President Truman's basic

fast action

WAA APPROVED DISTRIBUTORS OF GOVERNMENT-OWNED SURPLUS ELECTRONIC EQUIPMENT

(wholesale only)

American Condenser Co.
4410 No. Ravenswood Avenue
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Automatic Radio Mfg. Co., Inc.
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Belmont Radio Corporation
3633 So. Racine Avenue
Chicago 9, Illinois

Carr Industries Inc.
40-22 Lawrence Street
Flushing, L. I., N. Y.

Communication Measurements Laboratory
120 Greenwich Street
New York 6, New York

Cole Instrument Co.
1320 So. Grand Avenue
Los Angeles 15, California

Tobe Deutschmann Corporation
863 Washington Street
Canton, Massachusetts

Electronic Corporation of America
353 West 48th Street
New York 19, N. Y.

Electro-Voice, Inc.
Carroll & Cecil Streets
Buchanan, Michigan

Emerson Radio & Phonograph Corporation
76 Ninth Avenue
New York 11, N. Y.

Essex Wire Corporation
1601 Wall Street
Ft. Wayne 6, Indiana

General Electric Company
Building 267, 1 River Road
Schenectady 5, New York

General Electronics Inc.
1819 Broadway
New York 23, N. Y.

Hammarlund Mfg. Company, Inc.
460 West 34th Street
New York 1, New York

Hoffman Radio Corporation
3761 South Hill Street
Los Angeles 7, California

Hytron Radio & Electronics Corporation
76 Lafayette Street
Salem, Massachusetts

Johanns & Keegan Inc.
62 Pearl Street
New York 4, N. Y.

E. F. Johnson Company
206 Second Avenue, S. W.
Waseca, Minnesota

Majestic Radio & Television Corporation
125 West Ohio Street
Chicago 10, Illinois

National Union Radio Corporation
57 State Street
Newark 2, New Jersey

Navigation Instrument Co., Inc.
P. O. Box 7001, Heights Station
Houston, Texas

Newark Electric Co., Inc.
242 West 55th Street
New York 19, New York

Radio Parts Distributing Company
128 W. Olney Road
Norfolk 10, Virginia

Smith-Meeker Engineering Company
125 Barclay Street
New York 7, N. Y.

Southern Electronic Company
611 Boronne Street
New Orleans, Louisiana

Standard Arcturus Corporation
99 Sussex Avenue
Newark 4, New Jersey

Sylvania Electric Products, Inc.
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Technical Apparatus Company
165 Washington Street
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Tung-Sol Lamp Works, Inc.
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1062

Simplex
Pole Jacks

PULL OR STRAIGHTEN POLES... *Without Digging*

Compact and husky "H" beam sub-base provides a firm non-slip foundation, even on rough ground or in loose soil. Makes straightening poles, pulling butts or moving loaded poles a fast, easy job for one or two men. No. 329 handles poles of any size. No. 325, used for poles up to 30 ft. in height, includes 8' pike pole that's especially handy for straightening poles located beside ditches. Ask your distributor for full particulars, or write for Bulletin No. U46.

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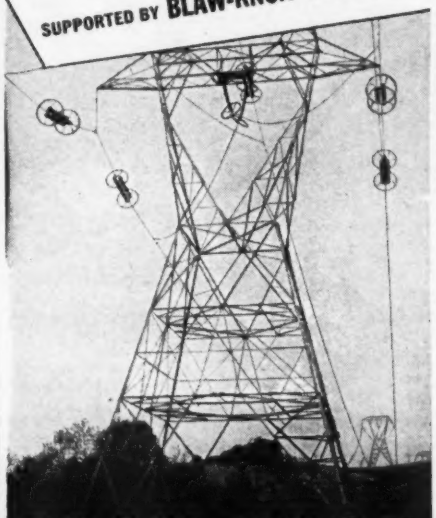
THE POWER LINES OF AMERICA
SUPPORTED BY BLAW-KNOX TOWERS



BLAW-KNOX
TRANSMISSION TOWERS

BLAW-KNOX DIVISION
of Blaw-Knox Company
2013 Farmers Bank Building
Pittsburgh, Pa.

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Electrical Design Engineer

UNDERGROUND LINES

Opportunity for permanent placement with a Large Utility Corporation is currently available to a Graduate Electrical Engineer able to qualify as follows:

Thorough knowledge of modern power cable work, including high voltage transmission cable. Considerable practical experience in cable engineering and operating all voltages. Experienced in the preparation of designs, estimates, reports, etc. Take charge of cable engineering staff.

State details in full concerning above; age and approximate salary desired, date available and address all replies to

Employment Supervisor
B. C. ELECTRIC RLY. CO., LTD.
Vancouver, British Columbia

policy of reducing prices, Mr. Schmitt declared that Emerson's profit of 5½ percent in the six months does not permit absorbing the recent 15½-cent wage increase.

•

Manufacturers Announce Plant Expansion Plans

Many electrical and allied manufacturing companies are making additions to their present plant capacity.

General Electric Co. has begun to install equipment for the manufacture of plastics molded parts in a newly purchased factory at Decatur, Ill. The plant, recently purchased from the War Assets Administration, will be converted into one of the largest plastics molding plants of its kind in the country. According to George P. Lehmann, manager of the plastics division, partial production at the new plant is expected this month with complete production scheduled for the end of the year. Mr. Lehmann said the new factory would eventually employ about 500 persons. The company has installed equipment and increased the facilities of its plant at Taunton, Mass., sufficiently to make possible in 1947 a record production quota of Mycalex, a stone-like plastic, Donald S. McKenzie, general sales manager of the chemical department, has announced.

Century Electric Co., St. Louis, has begun construction on a six-story and basement plant to house the small motor manufacturing division of the company. Located at the northeast corner of Nineteenth and Chestnut St., the new plant will provide for increased motor production of 25 percent.

Babcock & Wilcox Co. has announced plans for a two-year modernization program at its Barberton, Ohio, plant, involving improvement and replacement of machinery at an estimated cost of $1,500,000.

Directors of Columbia Electric & Manufacturing Co., Spokane, Wash., have authorized expenditure of $150,000 in 1947 on plant expansions preparatory to new production. Purchase of a warehouse adjoining its present property will provide factory space for new operations, Walter Toly, vice-president, stated.

Globe Lighting Products Co. has leased Building 250 of the New York Dock Co. at Clinton Wharf, Atlantic Basin, off Conover St., Brooklyn. The property, containing 33,000 sq. ft. of space, will be used for the manufacture of lighting products.

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

STANDARD TRANSFORMER CO., Warren, Ohio, has appointed John J. Carroll sales representative in Venezuela, with offices at Aparpado Postal 1522, Caracas, Venezuela.

C. P. CLARE & Co., Chicago, has opened a new Denver sales engineering office at 681 Grant St., Denver 3, Colo. Clyde P. Elliott, recently appointed Clare representative for the Mountain States, is in charge.

RADIO CORP. OF AMERICA has appointed the Telonda International Corp. as distributor of all its products in Italy. G. A. Biondo, formerly European sales manager of the RCA International Division, has been elected president of the Telonda International Corp., which has headquarters in New York and branches in Rome and Milan, Italy. Dr. Alessandro Banfi, formerly chief engineer of the Italian Broadcasting Co., has been named technical director of Telonda and head of its branches in Italy.

GLOBE LIGHTING PRODUCTS CO., New York, has appointed Morton J. Olschwang as head of Chicago operations. Mr. Olschwang brings a long record of industrial experience with him, previously having served in engineering capacities with Kay Electric and Franklin Electric of Atlantic City, West Philadelphia Electric Supply Co., and for the past six years with Lightolier Co. of Chicago.

F. W. POLLACK CO., Jackson, Mich., now representing several prominent electrical manufacturers in the state of Michigan and parts of Ohio, has augmented its sales force by taking into the company two sons of the founder, Frank W. Pollock, Jr. and Traverse K. Pollock, both engineering students of Michigan State College and the latter a recent lieutenant in the Navy.

•

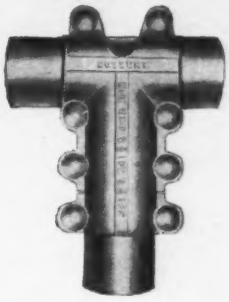
Pacific Union Changes Name

The name of the Pacific Union Marbelite Co., a wholly owned subsidiary of the Union Metal Manufacturing Co., Canton, Ohio, has been changed to Pacific Union Metal Co. to closer identify the company with the parent organization. Located at 3248 Long Beach Blvd., Pacific Union Metal manufacturers Marbelite centrifugally spun concrete street and highway lighting standards and also is southern California's agent for the parent company.

•

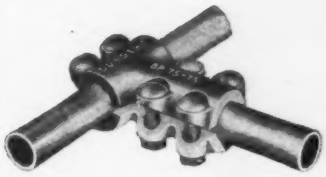
Announces Firm Prices

Announcement was made last week by W. H. Feldmann, president of the Electric Machinery Mfg. Co., Minneapolis, Minn., that all quotations on the company's listed products are now being made on a firm basis.



DOSSERT CONNECTORS

TUBULAR BUS CONNECTORS FOR POWER AND SUBSTATION UNITS

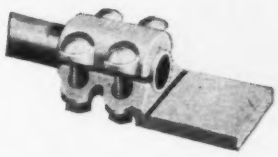


Type BPE

A HEAVY DUTY TEE CONNECTOR DESIGNED FOR RUGGED SERVICE. THE EXTRA BOLTS INSURE EXTREMELY HIGH CLAMPING PRESSURES. ESPECIALLY MADE FOR LARGE CONDUCTORS.

Type BP

AN ALL PURPOSE TEE CONNECTOR FOR ALL TYPES OF SERVICE.



Type TP

A CLAMP TYPE TERMINAL FOR CONNECTING TUBULAR BUSES TO FLAT SURFACES. CONTACT PADS AVAILABLE IN ANY SIZE AND DRILLING ON SHORT NOTICE.

"Insist on Genuine Dosserts"

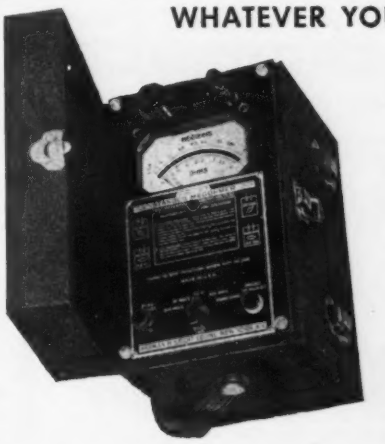
TO BE SURE OF A GENUINE "DOSSERT" MAKE SURE THE NAME "DOSSERT" IS ON YOUR CONNECTOR.

Send for Catalog 45

DOSSERT MFG. CORP.

249-254 Huron St. Brooklyn 22, N. Y.

WHATEVER YOU CALL AN INSULATION TESTER



THE NEW

MODEL B-7 MEGOHMER

IS TOPS

COMBINED PRECISION OHMMETER & MEGOHMMETER
0-20, 0-200 MEGOHMS. 0-200, 0-20,000 OHMS.

Reads as low as 1/10 of 1 Ohm to as high as 200 Megohms. 2 Test Potentials 250/500 Volts. No cranking, no wavering of pointer. Saves time and effort. Simplifies Insulation Testing. Ideal for low resistance testing too.

WRITE FOR NEW BULLETIN 440

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32 PARK PLACE NEW YORK 7, N. Y.

ELECTRITE

A high grade fibre board for electrical insulation. A material of quality possessing high tensile and dielectric strength. Used by many of the leading manufacturers of electrical equipment.

DENSITE

An extremely hard board of superior quality which can replace the more expensive types of insulating materials.

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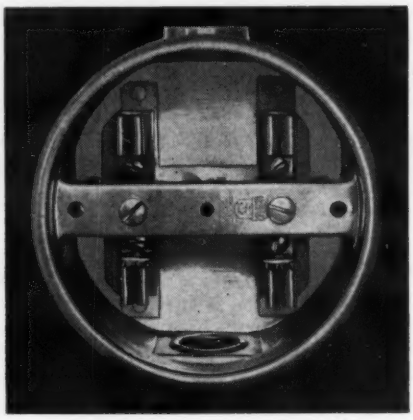
REG. TRADE MARK ANCHOR

METER SERVICE EQUIPMENT

Cat. No. 9000

Drawn Aluminum Alloy Socket For
Single Phase Type S Meters



Furnished With Either Two or Three
Threaded Outlets — 1" or 1¼"

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MANCHESTER, N. H.
SALES OFFICE
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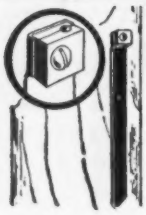

Packaged Lightning Protection

MASTERGRIP GROUNDEX

THE PREFABRICATED POLE BUTT GROUND

- *Protects Poles from Lightning*
- *Grounds Neutral Systems*
- *Copper Plate, Strap and Clamp are Complete in One Unit*

GROUNDEX, the utility industry's first and only completely prefabricated pole butt ground, insures a positive ground under varying soil conditions. It combines copper plate, strap and clamp in one unit, and can be installed in a few seconds.

GROUNDEX is the most economical butt ground. It saves its own cost in material and labor. The down wire can be easily disconnected from the clamp near the ground level thus facilitating testing for ground resistance. GROUNDEX has been accepted as the standard pole ground by municipal and private utilities as well as REA cooperatives everywhere.

Installation men also like Mastergrip Malleable Iron Multi-Lock Anchors. Write today for Anchor Bulletin No. 941.

MASTERGRIP UTILITIES SUPPLY CORP.
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Write for Groundex Bulletin 247

IF IT'S PFD*... IT'S P.F. DECALS

ELECTRICAL SUPPLIES

F.F. DECALS are always preferred* by electrical supply manufacturers. They're economical, durable, brilliant.

PALM FECHTELER produces distinguished decals for every purpose — trucks, products windows.

Write for samples. See why DECALS are always PFD.

Palm, Fechteler & Co.
220 WEST 42nd STREET, NEW YORK 18, N. Y.

Recent Rate Changes

KANSAS GAS & ELECTRIC CO.'s electric rate reductions, totaling approximately $300,000 annually and averaging 9 percent for all residential customers, have been approved by the State Corporation Commission. A special feature of the new rates is the provision for billing the average amount of electricity used in operating electric ranges and water heaters at one cent per kilowatt-hour.

MOUNTAIN STATES POWER CO. has filed with Public Utilities Commissioner George H. Flagg a new electric rate schedule for Coos County, reducing rates in that territory by approximately $70,000. The new schedules will go into effect on June 1. Commissioner Flagg stated some 9,000 customers will benefit. Residential decreases amount to $24,516 annually and commercial rates have been cut by $45,841 a year.

CENTRAL ILLINOIS ELECTRIC & GAS CO.'s new rate schedule, effecting an annual saving of $22,880 to 550 commercial and small electric power users in Lincoln, has been approved by the Illinois Commerce Commission.

POTOMAC ELECTRIC POWER CO.'s petition for a review of an order of the District of Columbia Public Utilities Commission, which the utility said cut its rates by more than $1,000,000 annually, has been denied by the U. S. Supreme Court.

•

Washer, Ironer Sales Hit Peak in First Quarter

Sales of household washers and ironers during the first quarter of this year broke all records and surpassed some previous highs by as much as four to one, or more, the American Washer and Ironer Manufacturers Association, has announced.

During the first quarter of this year, washer sales were 835,468, compared with 309,735 in the same period of 1946, an increase of 170 percent, and were even higher than the total for the first half of last year. Ironer sales in the opening quarter of 1947 amounted to 113,190, compared with 19,552 in the corresponding period of last year, an increase of 478 percent.

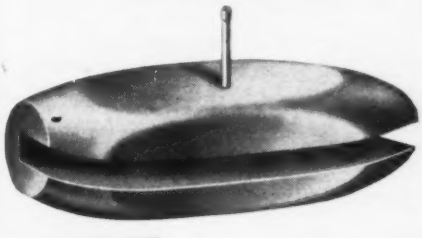
Washer sales in March, 1947, totaled 287,397, compared with 104,296 in March, 1946, an increase of 175 percent. Ironer sales in March were 42,442, an increase of 373 percent over March, 1946.

•

Will Vote on Stock Increase

Stockholders of the Arrow-Hart & Hegeman Electric Co. will vote at a special meeting on June 4 on a plan to increase authorized capital to 800,000 from 375,000 shares. No change will occur in par value, which is $10, the new shares being paid for by a charge to surplus.

THE NEW GUARD THAT HAS BECOME SO POPULAR



Flexibal

The GUARD that *gives* with the GUY

Literally a string of pillows, the Overton-Flexibal Guy Guard cushions the shock. It is the only guard that *gives* with the guy. No other type is so easy to handle, so simple to install. None other is so effective in cutting down losses. Nothing ever puts it out of commission. And they cost less! Separate spindles, smoothly shaped, are made of hard wood and aluminum-painted for greatest visibility and long life. Adjustable to any length in 6-inch steps. 5-6-7-8 foot lengths boxed for immediate shipment,—no waiting. Modernize your guy wire guards now,—you'll never go back to the old rigid style once you try Overton-Flexibal. Field-tested for years in thousands of locations.

AVAILABLE NOW, AND AT ALL TIMES

PACKAGED FOR EASY HANDLING AND STORAGE

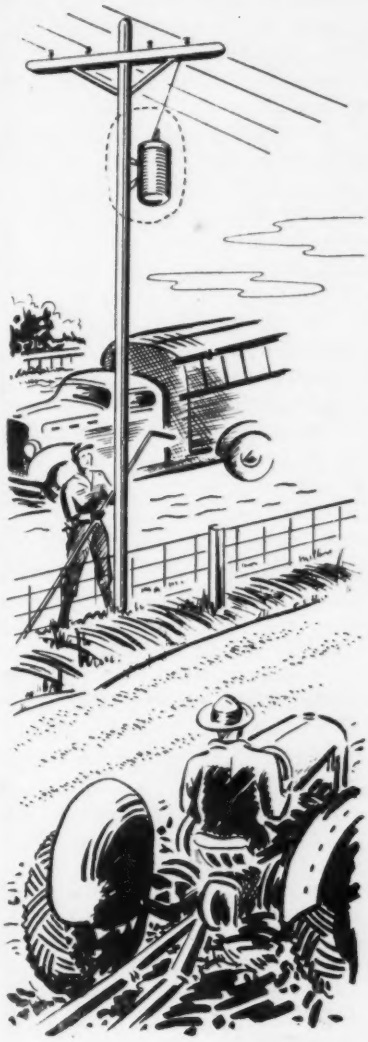
Send for Free Sample

Flexibal **GUY GUARD**

is produced solely by

S.E. OVERTON CO.
SOUTH HAVEN, MICHIGAN

INCREASE THE EFFECTIVE CAPACITY OF YOUR SYSTEM WITH *Peak-trol* * OFF PEAK LOAD CONTROL



Peak-trol steps up the effective capacity of generating and distribution systems by disconnecting off-peak loads during periods of heavy power demand. Water heaters and other off-peak loads are removed from service during peak periods, releasing your capacity for other loads during this period.

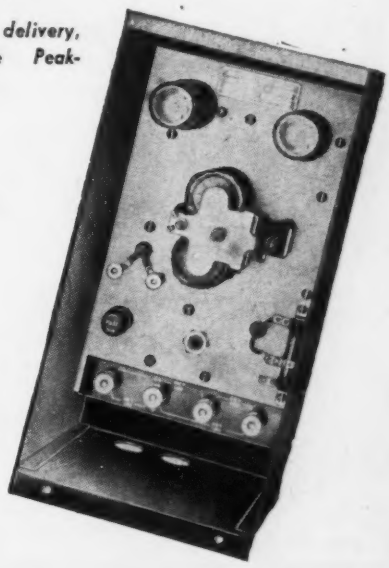
Load factor improves when Peak-trol is installed because storage loads can be removed from load peaks and serviced during periods of lower power demand.

Operating costs go down when Peak-trol is in operation because excessive demand charges, generating costs and distribution costs go down as Peak-trol lowers your load peaks.

Service improves by the use of Peak-trol because of improved voltage regulation and reduction in peak load losses.

Peak-trol offers you a flexible, effective way to control electric water heaters and other off-peak loads. Peak-trol can operate any time during the day or night that it is required, irrespective of changing peak-load times.

For early delivery, investigate Peak-trol now.



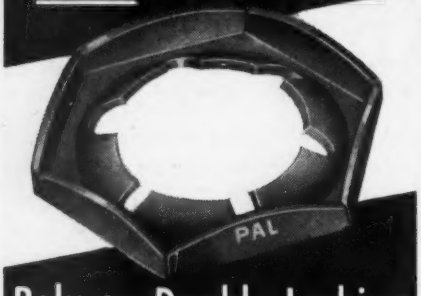
- **Increases Effective Capacity**
- **Improves Load Factor**
- **Lowers Operating Costs**
- **Improves Service**

CONTROL CORPORATION

718 Central Avenue, Minneapolis, Minn.

* Registered

Wherever Bolted Assemblies Must Stay Tight



Rely on Double Locking

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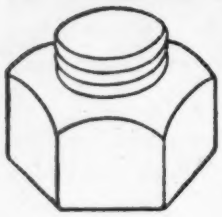
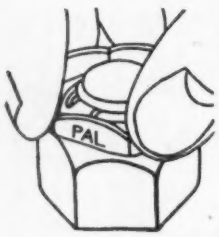
—and save cost, too!



THIS ORDINARY ASSEMBLY, consisting of bolt and regular nut, can be kept absolutely tight in service



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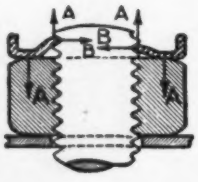

*Double-locking action

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LETTERS TO THE EDITOR

As Bad As This?

To the Editor of ELECTRICAL WORLD:

During the past decade the electric utilities have had the experience of seeing loads grow without much regard to the personnel of commercial or sales divisions. This has had a sad effect upon the heads of these departments as well as on officers and directors. There seems to be a tendency to say, complacently, "Oh, well, we have all the load we can handle now and most of it was secured without much of a sales department so why spend money for an efficient, intelligent corps of sales engineers?"

The old adage, "You never stand still, you either go forward or backward," is as true today as it was when the electric utilities were the leaders in business development. They were then the favorite business for the young men who wanted to progress to responsible positions thru working in interesting, glamorous, competive, challenging jobs. Something should be done to make it possible again to interest many young ambitious men in a future with the industry. The $64.00 question is "How can young men be persuaded to make the electric utility business their life's work?"

Four Motivations

If we consider the fundamentals, we find that there are only about four motivations for a young man to enter a particular industry. These are in order of their importance,

(1) Good starting salary
(2) Promising future
(3) Interesting work
(4) Experience

(1) Good starting salary. Recently a sales executive of a well known electric utility visited a technical school and interviewed a large number of near-graduates about a position with his company. He came away without one real prospect. The starting pay rate was so ridiculously low in comparison with other industries that all he got was a sarcastic laugh. When asked why he didn't up the rate, he replied if that were done it would be necessary to increase most of his present sales engineers and that would cost money.

(2) Promising future. What kind of a future can the utility offer young men? Perhaps the short answer may be found in the enormous turn-over in employees. Many a man has started with the sales department full of enthusiasm

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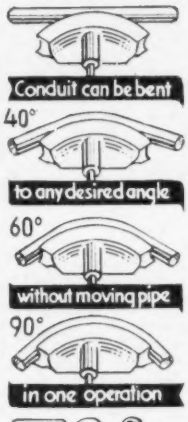

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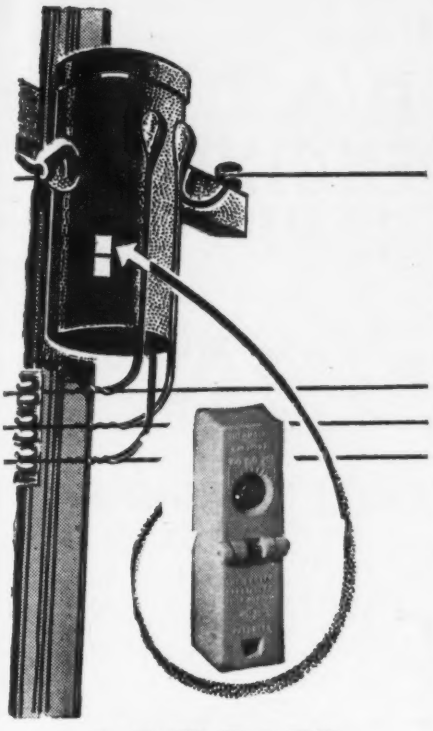

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and ambition, only to find (1) that he has no chance to use his initiative, (2) that in many cases the better jobs are given to outsiders who are the pets of some of the executives or directors or their friends, (3) that salary increases are almost unknown or at best are so small as to be negligible, (4) that red-tape and "yes-men" executives discourage or even forbid independent thinking, (5) that too many times new ideas are ridiculed and later turn up as the product of the great brain of the boss. One prominent company has a sales department where only one out of more than 30 ex-service men has returned to his old job. That one exception is right now looking for a change. What's the answer? No future.

Has Interest Died?

(3) Interesting work. A good many years ago the electric utility was the favorite of the progressive youngster who got a thrill out of helping in the development of a great public service business that was continually trying something new, something revolutionary, something for the benefit of all mankind. Yes, it was interesting work. It generated a lot of personal satisfaction in those days when the leaders of the industry were pioneers who really knew their way around. Another added handicap is the combination company where even the best plans have to bow to the ever present question as to whether the new sales activity will have an adverse effect on the net return of the gas end of the business. The average company of today is a creature of red-tape, of rules and regulations, of rates that sell the red kilowatts at a different rate from the blue or yellow kilowatts. It is a follower of reactionary precedent, of the theory that it is better to try nothing new for fear it might be something that the big bosses would not like. All of these things and a lot more subtract from the will to do a good job or to an interest in the work.

(4) Experience. Many an ambitious man has accepted a job, otherwise unsatisfactory, because he thought there was an opportunity to gain experience and education in a good profession. But the utility has lowered that job value by too much specialization and by unwillingness to let an employee do anything on his own. Once a lighting man, always a lighting man. Once a power man, always a power man. Besides, training courses along general lines are almost unknown. Why shouldn't a man be allowed to learn about all branches of the business, especially in the sales department? It would make him of greater value to the utility as well as broaden his education. Perhaps one of the reasons for this lack may be indicated by the remark of a sales executive

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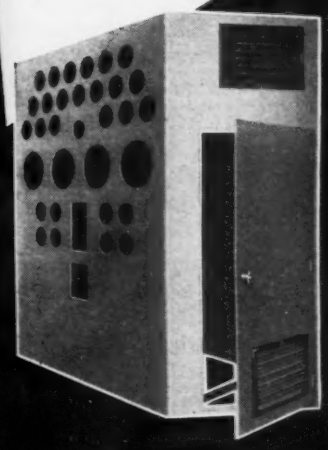

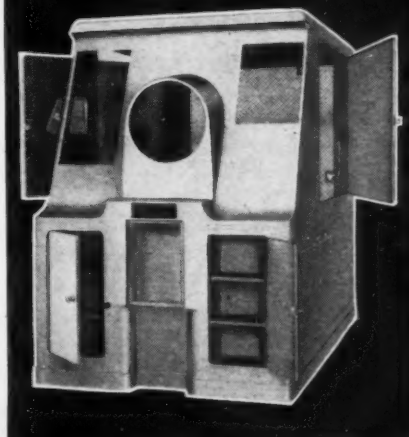

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A Well-Wisher of the Industry

Ed. Note: See editorial "What About Young Men?" in this issue.

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More Light on Runway Approach Lighting

To the Editor of ELECTRICAL WORLD:

I should like to comment on several statements appearing in the news article "Manufacturers Offering High Intensity Lights for Airports" appearing on page 89 of the March 15th issue of ELECTRICAL WORLD.

The opening paragraph of this article reports the entry of American Gas Accumulator Co., and Sylvania Electric Products Co. into the high intensity airport runway approach light market, stating: "Both are in line for contracts with the Civil Aeronautics Authority as a result of tests of their products now nearing completion at Newark, N. J., airport by an aviation joint committee."

To my knowledge tests had not been started at the date the article was published. Installation of control transformers, which we supplied for this test installation, had just been completed on March 21 when I was at Newark airport.

Neither of the two named systems have been accepted by CAA where federal funds are used. The Newark installations are being sponsored by the airlines for test purposes. No experience or factual data had been obtained as of March 21.

Mr. J. B. Bartow, whom you identify as "head of the Airport Lighting Section, Line Material Co.," is in fact associated with Bartow Beacons, Inc., Wings Field, Blue Bell, Pa., and Aviation Lighting Consultant to the Line Material Co., who are exclusive manufacturers of Bartow-High Intensity Lighting Systems.

You say, "Bartow thinks glare is bad and has always used a narrow beam so that only three or four lights are full in the pilot's eyes at one time. But he is now widening his beam a little and is using multiple rows to get a wider beam effect."

It is a mis-statement that Bartow is widening his beam and using multiple rows. Actually the beam in terms of light distribution is more narrow but is movable over a wide angle. We definitely disagree with this theory (wide beam distribution) as it violates good engineering principles.

The article continues: "A.G.A. contends, with some confirmation by both test stations, that glare is not serious."

It should be explained that this is true only for daytime conditions. Tests

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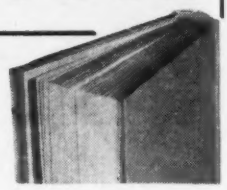

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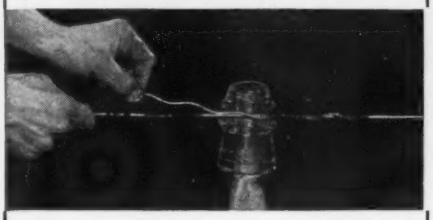

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at Arcata showed conversely, as Bartow contended, that at night there would be glare during bad weather.

Further, the last part of this statement is not clear and is rather confusing. I refer to "that glare is not serious—because the pilot, in last stages of approach, needs see only lights, which give him a complete reference," etc.

Regarding the statement that "experts are divided on the relative merits of one or two rows of approach lights. Right now Newark thinks one row is best," I do not know who is included under the term "Newark thinks one row is best." It is true that there are proponents of one row approach, but that is confined to perhaps only a very few pilots, whereas the proponents of two rows are by far in the majority. Engineering principles show that two rows are necessary for creating a perspective and that one row, lacking this perspective, can at times misinform the pilot. The only advantage of the single row is a saving of installation expense.

Warren H. Edman
Manager, Airport Lighting Div.
Line Material Co.
Milwaukee 1, Wis.

ELECTRICAL WORLD is grateful to Mr. Edman for an able clarification of a complex subject.—The Editors

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Manufacturers Issue Earnings Reports

Electrical manufacturing companies, which have recently issued statements of earnings, include the following:

SQUARE D CO.—Earnings for 1946 amounted to $2,704,626, comparing with 1945 earnings of $1,688,959. Per share earnings were $1.96 on the presently outstanding common stock, against $1.18 after preferred dividends in 1945, based on 1,377,480 common shares outstanding after the three-for-one split in April, 1946. Sales for 1946 totaled $29,154,817 against the previous year's volume of $40,556,639.

RADIO CORP. OF AMERICA—Net earnings in 1946 amounted to $10,985,053, equivalent to 56.4 cents per share of common stock, comparing with $11,317,068 in 1945, when earnings after payment of preferred dividends were equivalent to 58.8 cents per share. Total gross income from all sources amounted to $236,980,770, representing a decrease of 15.2 percent, compared with the total of $279,503,615 in 1945.

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